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Industrial Arts and Vocational Education

1914 40th Anniversary Year 1954

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

SCHOOL SHOP ANNUAL

Breaking through the Resistant Crust

Photo courtesy
Monsanto Chemical Company

In the man's hands is the equivalent in Krilium of pile of compost between man and boy. Krilium is not subject to bacterial attack, lasts much longer.

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In some men you sense a resistance that is like nothing in the world so much as hard-packed, barren and unproductive earth. With some men, perhaps it is too late. But with boys in their early teens, habits have not hardened and every educator owes it to the boy, to himself, and to society to apply some aerating and softening influence so that the native fertility and productivity in every boy can break through.

Surely educational theory agrees the lad's interest must be pulled beyond himself so that the back and forth traffic set up can increasingly get through. Certainly educators agree enthusiasm must be focused on something bigger, better and beyond the lad's own petty ego. Certainly in mechanical drafting there is golden opportunity not only in a new class, a new subject, but in the fact the boy is linking brain and hands in a task that is the first step on a road that can lead to the self-transcending goals of engineering, scientific and other creative contribution . . . with good to the world, with honor, prestige and appreciation to the giver.

What better can anybody ask? And why run the risk of contradicting all the influences brought here to bear, by permitting indifference in the selection of the drafting tools with which the boy will work? Certainly the concept of the value to boy and environment alike is worth far more than the petty economy to be gained by cheap and worthless tools.

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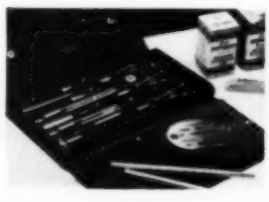

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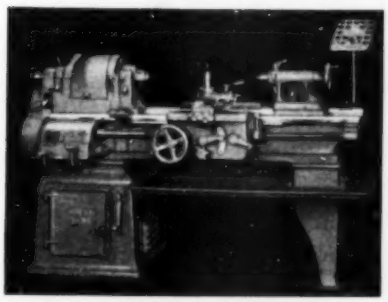
Lathe Tools And Attachments

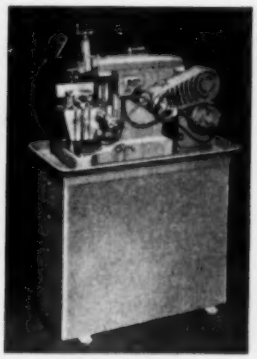


16" Toolroom Lathe

14½" Quick Change Gear Lathe

13" Toolroom Lathe

14" Drill Press

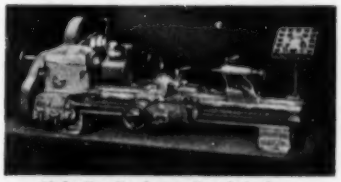


7" Bench Shaper

10" Quick Change Gear Lathe

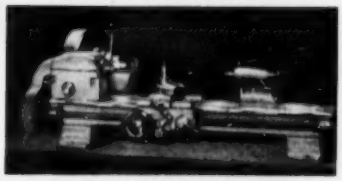
9" Floor Lathe

Pedestal Grinder

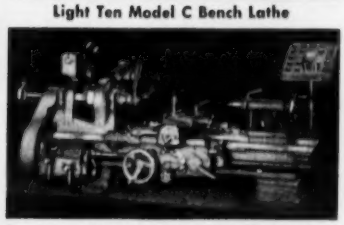


Light Ten Toolroom Bench Lathe

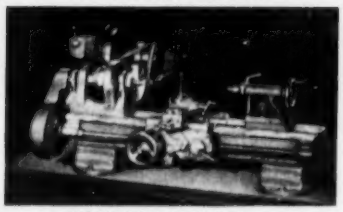
Light Ten Model B Bench Lathe



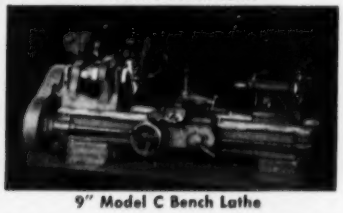
Light Ten Model C Bench Lathe



9" Toolroom Bench Lathe



9" Model B Bench Lathe



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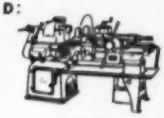
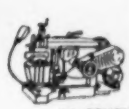
☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES



☐ ½" & 1" Collet TURRET LATHES

☐ TOOL GRINDERS



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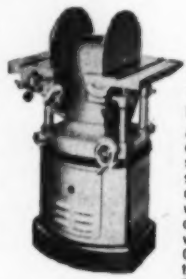

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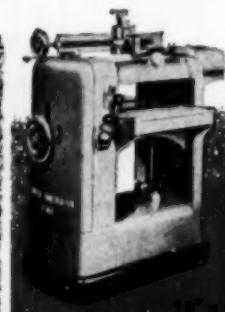
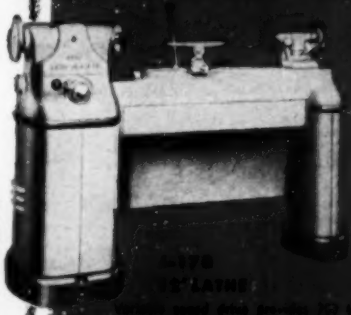
16" DISC SANDER
Available in single or double disc, or as single disc with belt sander. Vee-belt drive; ¾ HP motor with double disc machine, ½ HP motor with single disc. Counterbalanced table 8½ x 20¾". Tilts 30° up to 45° down.



J-150
18" x 6" SURFACER



J-170
15" LATHE

J-140
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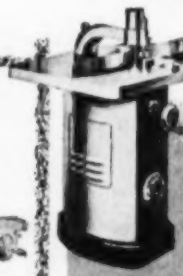

J-150
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MARCH
1954

VOL. 43 NO. 3

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

Published on the 15th of the month preceding the date of issue by **THE BRUCE PUBLISHING COMPANY**, 400 North Broadway, Milwaukee 1, Wisconsin • **CENTRAL OFFICE**: 20 North Wacker Drive, Chicago 6, Illinois • **EASTERN OFFICE**: 225 Broadway, New York 7, New York.

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This Month's Cover

The picture for the 1954 March cover shows two budding printers locking up a type form in the graphic-arts department of the Senior High School, Tucson, Ariz. The picture was made by Kay Thornton. Harry A. Goldstein, instructor of photography, submitted the photograph.

* * * * *

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1954, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price in the United States, U.S. possessions, and Canada, $3.00 a year, payable in advance. In all foreign countries, $3.75. Copies not more than three months old, 35 cents; more than three months old, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for upon publication. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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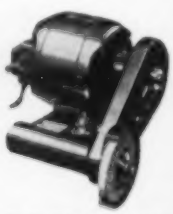

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ASSOCIATION NEWS

COMING CONVENTIONS

Mar. 12–13. California Industrial Education Association, at Fresno Hotel, Fresno, Calif. Secretary, Lee D. Bodkin, 13 Education Building, UCLA, Los Angeles 24, Calif.

Mar. 18–20. New Jersey Vocational and Arts Association, at Berkeley-Carteret Hotel, Asbury Park, N. J. Secretary, Mrs. Hazel N. DeCamp, 8 Mountain View Place, Irvington 11, N. J.

Mar. 22–27. American Industrial Arts Association, at the new Statler Hotel, Los Angeles, Calif. Secretary, D. Arthur Bricker, 216 E. 9th St., Cincinnati 2, Ohio.

Exhibit chairman, Ely Van Hart, 117 Kipling Rd., Elizabeth 3, N. J.

Mar. 25–27. Indiana Industrial Education Association, at French Lick Hotel, French Lick, Ind. Secretary, H. G. McComb, State Director of T. & I., 215 State House, Indianapolis, Ind.

Mar. 25–27. Ohio Industrial Arts Association, at Neil House, Columbus, Ohio. Secretary, H. F. Edgar, 239 Clinton St., Waseon, Ohio.

Mar. 26. Alabama Vocational Association, at Phillips High School, Birmingham, Ala. Secretary, H. R. Culver, Thach Hall, Auburn, Ala.

Apr. 8–10. Florida Vocational Association, at McAllister Hotel, Miami, Fla. Secretary, Mrs. Julia Burns, Brewster Vocational School, Tampa, Fla.

Apr. 8–10. Illinois Vocational Association, at Leland Hotel, Springfield, Ill. Secretary, Paul R. Waugh, Board of Education, Peoria, Ill.

Apr. 8–10. New York State Vocational and Practical Arts Association, at Hotel Statler, Buffalo, N. Y. President, Jos. C. Deluhery, N. Y. State Vocational and Practical Arts Association, 1500 Elmwood Ave., Buffalo 7, N. Y.

Apr. 9. Tennessee Vocational Association, at 202 Memorial Bldg., Nashville, Tenn. Secretary, W. A. Seeley, 202 Memorial Bldg., Nashville, Tenn.

Apr. 11–15. Western Arts Association, at Pantlind Hotel, Grand Rapids, Mich. Secretary, George S. Dutch, Geo. Peabody College, Nashville, Tenn.

Apr. 16–17. Missouri Industrial Education Association, at Education Building, University of Missouri, Columbia, Mo. Secretary, Maurice L. Stewart, State Department of Education, Jefferson City, Mo.

Apr. 16–17. Missouri Vocational Association, at University of Missouri, Columbia, Mo. Secretary, H. H. London, University of Missouri, Columbia. Mo.

INDIANA INDUSTRIAL EDUCATION ASSOCIATION

The Indiana Industrial Education Association will hold its annual meeting at French Lick Springs Hotel, French Lick, Ind., on March 25, 26, and 27, 1954.

The Thursday program is planned especially for teachers and directors of vocational education. H. G. McComb, state director of trade and industrial education will meet with the various groups to discuss teaching problems.

On Friday morning the annual business meeting will be held.

On Friday afternoon, the meetings will be of interest to all teachers of industrial arts, vocational industrial education, and distributive education. Dr. William Micheels, professor of industrial education, University of Minnesota, will be one of the out-of-state speakers. His topic will be "Creative Teaching in Industrial Education."

(Continued on page 6A)

New members admitted into the Alpha Chapter of Epsilon Pi Tau at Bowling Green State University, Bowling Green, Ohio

Front row, left to right: Robert Putman, Robert Ewing, James Hathaway, John Huebner, Frederick Pauly

Back row, left to right: Otto Beinderf, Audus Runyan, Gene Smith, Charles Thomas, John Whitacre

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ASSOCIATION NEWS

(Continued from page 4A)

Glen Massman, executive secretary of the Dayton Ohio Foremen's Clubs, will address the group on the topic, "Human Engineering."

The annual banquet will be held on Friday evening.

On Saturday morning the group will hold section meetings designed to meet the needs of teachers in the fields of: auto mechanics, drafting, general shop, machine shop, building trades, Diversified co-operative occupations, electricity, printing, related subjects, and distributive education. The organization has grown rapidly and now will require approximately 250 people working on various committees to plan and execute the plans already made for the three-day meeting.

The meeting will close on Saturday afternoon following the Ship's Luncheon, at which the new officers will be installed.

The officers of the Indiana Industrial Education for 1953–54 are: president: R. Paul Lightle, Ft. Wayne, Ind.; vice-president: Prof. Ammon Swope, Purdue University; secretary-treasurer: H. G. McComb, State House, Indianapolis.

WAYNE COUNTY REGION OF THE M.I.E.S. MEETS IN CANADA

Between 50 and 80 members of the Wayne County region Michigan Industrial Education Society, went to Windsor for their first meeting in Canada. Canadian speakers gave them information about the educational methods in Canada.

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Personal News

♦ Dr. Pier A. Abetti of Pittsfield, Mass., age 32, who recently received his doctor of philosophy degree from Illinois Institute of Technology, Chicago, Ill., has been named the nation's outstanding young electrical engineer for 1953.

Dr. Abetti, chosen by the Eta Kappa Nu association, the national electrical engineering honor society, will receive the award during the annual winter meeting of the American Institute of Electrical Engineers in New York City.

He is a development engineer in the power transformer works of the General Electric Company in Pittsfield.

He was born in Florence, Italy, came to this country in 1946, and since has become a United States citizen. In Italy he attended the University of Florence, the Polytechnical Institute of Turin, and the University of Pisa.

In the United States, he continued his studies at Illinois Institute of Technology, Chicago, where he received a master of science degree in power systems engineering in 1948 and a doctor of philosophy degree this year.

♦ James E. Baker of Chicago has been added to the staff at Greer Technical Institute, Chicago. He is instructing classes in the two-year diesel-automotive engineering course.

Mr. Baker has his B.S. degree from the University of Chicago in addition to 15 years' experience in industry. His army service was spent as a radio technician overseas.

♦ Carson J. Orr of Harvey, Ill., has recently been selected to teach at Greer Technical Institute, Chicago.

Mr. Orr has earned his B.A. degree from Valparaiso University. He has ten years of industrial experience, most of which was with the Buda Diesel Plant. He will teach diesel and related subjects in the new two-year Diesel automotive engineering course.

♦ Fred M. Mason, board member, Vocational and Adult School, Madison, Wis., and long-time member of IGAEA, was the master of ceremonies at the 33rd Annual Banquet of the Wisconsin Typographical Contest.

♦ Judson M. Bradley, head of the Printing Department, Sherman Institute, Riverside, Calif., was elected outstanding craftsman for the 12th District of the International Association of Printing House Craftsmen.

♦ Vernon G. Eck and Elmer R. Lundgren, cochairmen of the Printing Clinic of the Minnesota Vocational Association Convention held on October 30, 1953, conducted a most interesting meeting which featured a demonsrtation of offset platemaking and operation of a small offset press.

♦ George T. Hart, teacher of printing at Benjamin Franklin High School, Rochester, N. Y., retired recently after 37 years of teaching. He will be remembered for his interest and activity in student clubs in the early years of our associational work.

♦ H. P. Harshbarger was appointed recently by the Illinois State Department of Registration and Education to serve a four-year term on the seven-man executive board under the new Illinois Vocational Schools Act — a law passed in July, 1951, by the State Legislature for the regulation and certification of all vocational schools in the state.

Mr. Harshbarger is the superintendent of the Greer Technical Institute, Chicago, Ill.

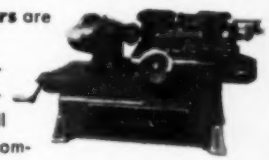
♦ Arnold G. Nelson, assistant professor of English at The Stout Institute, Menomonie, Wis., received the Ph.D. degree in American Studies from the University of Minnesota at graduation exercises held at the conclusion of its fall quarter.

(Continued on page 34A)

Power to make the grade... in training and on the job!

B&D Drills give students practical experience in all kinds of drilling: in metal, wood, plastics, masonry. Drive Hole Saws, double as sturdy drill presses in B&D Bench Stands.

B&D Valve Refacers are the finest equipment made for training students to grind factory-accurate angles in all types of internal combustion engine valves.

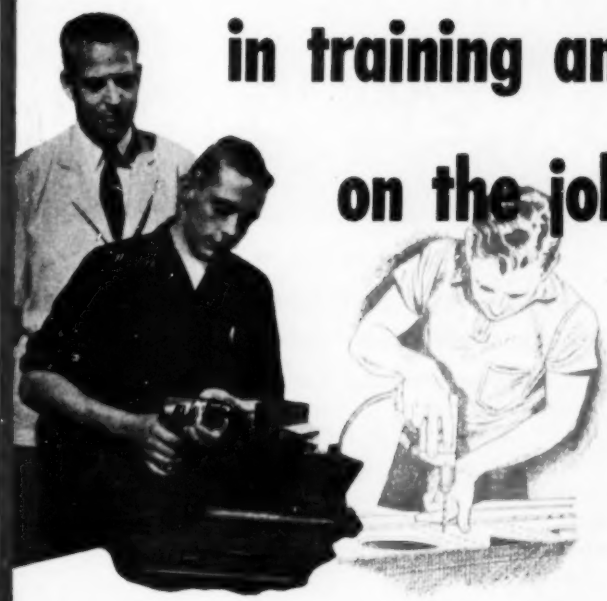


B&D Vibro-Centric* Valve Seat Grinders train students to put mirror finishes on all internal combustion engine valve seats in a few seconds. Easy to operate.

* Trade Mark Reg. U. S. Pat. Off.

B&D Sanders help you teach many finishing jobs—sanding, grinding, burnishing, cleaning. Drive abrasive discs, saucer grinding wheels, "Whirlwind" wire cup brushes.

B&D Automatic Polishers train students to clean all types of metal surfaces. Cleans, polishes, seals in one operation. Light weight. Three models.



THERE is no better way to prepare a student to win his place in industry than to teach him with the tools he'll use on the job.

And there are no better tools to teach him with than Black & Decker Portable Electric Tools . . . for years the overwhelming choice of industry.

Black & Decker Drills, Valve Refacers, Valve Seat Grinders, Sanders, Polishers . . . they're the tools your students will find on the job. For good reason. All of these B&D Tools are built to fit job requirements. They're powered by B&D-built universal motors, with husky housings and precision parts that can take it. Easy to handle, they're equipped with safety devices to overcome beginner nervousness. And in the long run they cost less because they outlast cheaper types.

Investigate these B&D Tools (and all the others in the B&D line). See your B&D Distributor for demonstration—his address is listed in the telephone book Yellow Pages under "Tools-Electric." Write for catalog No. 10. Free. Address: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Maryland.

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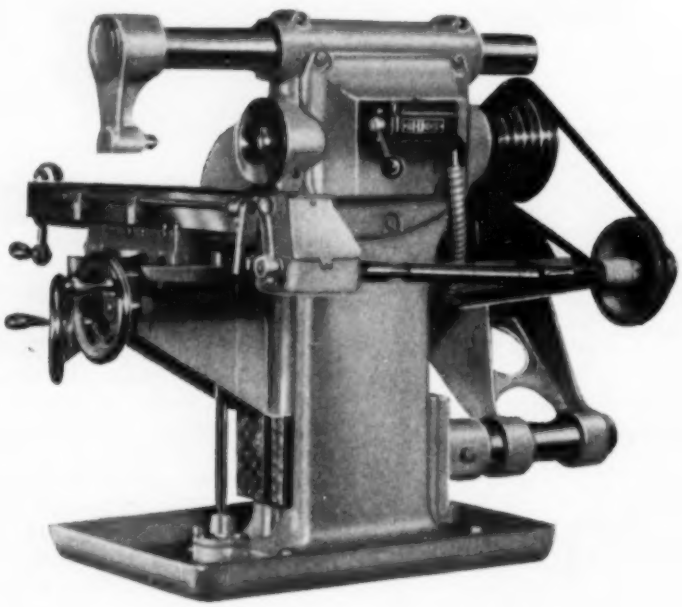
BURKE BENCH MILLING MACHINES

ARE THE SKILLS THEY TEACH IN AMERICA'S BEST EQUIPPED SCHOOL SHOPS

Hundreds now in use in School Shops prove that simple, economical, versatile Burke Bench Millers are ideal for practical instruction in all milling machine operations. Their modest cost in proportion to their high educational worth make them outstanding investments as teaching equipment.

Accurate Rugged. Capacities large enough for most instructive operations.



The favorite small millers of America's foremost Industries.

So versatile they can practically reproduce themselves.

Universal No. 4 Power feed model illustrated. Also available in hand feed and other power feed models.

Complete data gladly supplied on various models and standard attachments.

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COLUMBIAN VISES are preferred by schools... EVERYWHERE!

Dependability, ease of operation, long life —these are only a few of the many reasons why more Columbian Vises are used in school shops than any other make.

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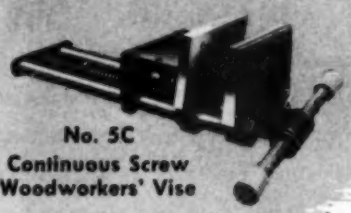
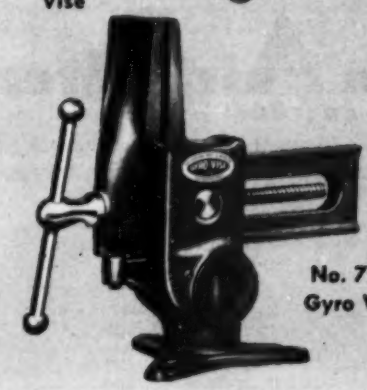


No. 5C
Continuous Screw
Woodworkers' Vise

No. 5CD-S
Continuous Screw
Adjustable
Steel Handle

No. 6CD
"Woodcraft"
Vise



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Gyro Vise

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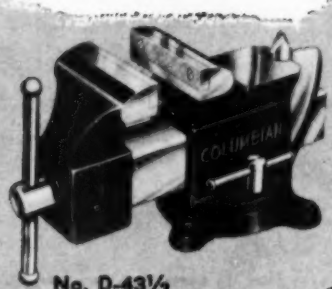
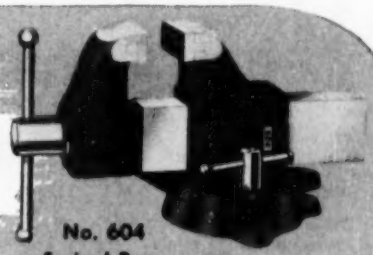
COLUMBIAN VISE
for every need
and purpose—



No. D-43½
Home Workshop
Vise



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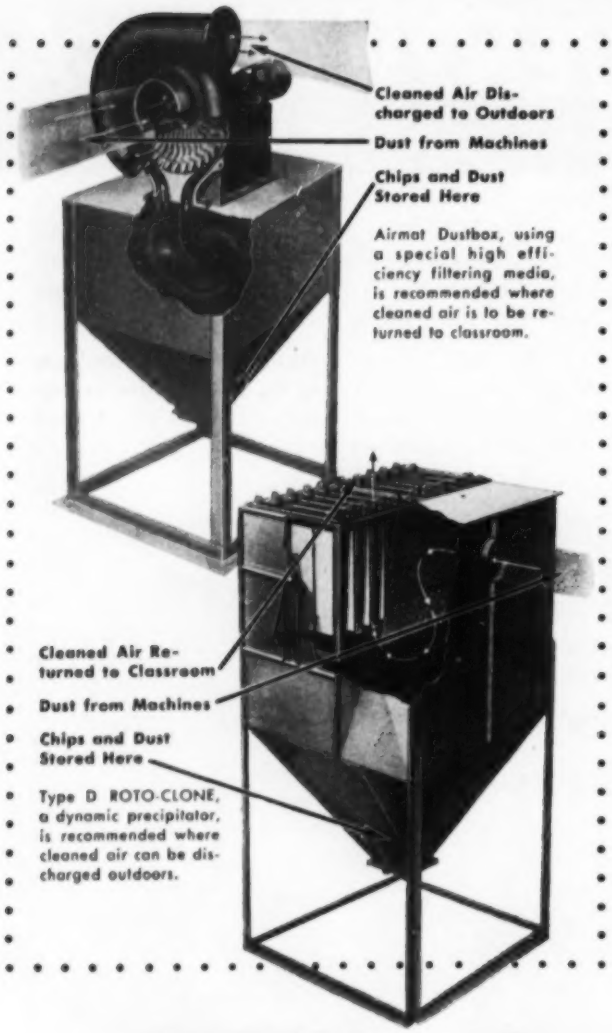
IN YOUR WOODWORKING DEPARTMENT?


Cleaned Air Discharged to Outdoors
Dust from Machines
Chips and Dust Stored Here
Airmat Dustbox, using a special high efficiency filtering media, is recommended where cleaned air is to be returned to classroom.
Cleaned Air Returned to Classroom
Dust from Machines
Chips and Dust Stored Here
Type D ROTO-CLONE, a dynamic precipitator, is recommended where cleaned air can be discharged outdoors.

65 schools now enjoy clean air and lower cleaning costs with AAF Dust Control

Isn't it logical that students deserve the same clean environment provided industrial employees using woodworking machinery? 65 schools in 18 states, Alaska and Canada, believing they should, have found the practical and economical solution in AAF Dust-Control Equipment.

There's a choice of two AAF Dust Collectors for this service—the Airmat Dustbox for installations where return of cleaned air to the classroom is desired, and the more compact Type D ROTO-CLONE for discharge of cleaned air to the outdoors. Both units are completely self-contained, require little space and store the collected material for easy disposal.

A woodworking department with dust-free air and devoid of the litter of chips, sawdust, shavings and sander dust! You can make it a reality easily and economically with AAF Dust Control. Mail this coupon, today, for complete information!

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COMPANY, INC.
203 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P Q.

Mail this coupon TODAY!

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Please send me Bulletin No. 272-E1 describing AAF Dust-Control Equipment for Woodworking Departments.

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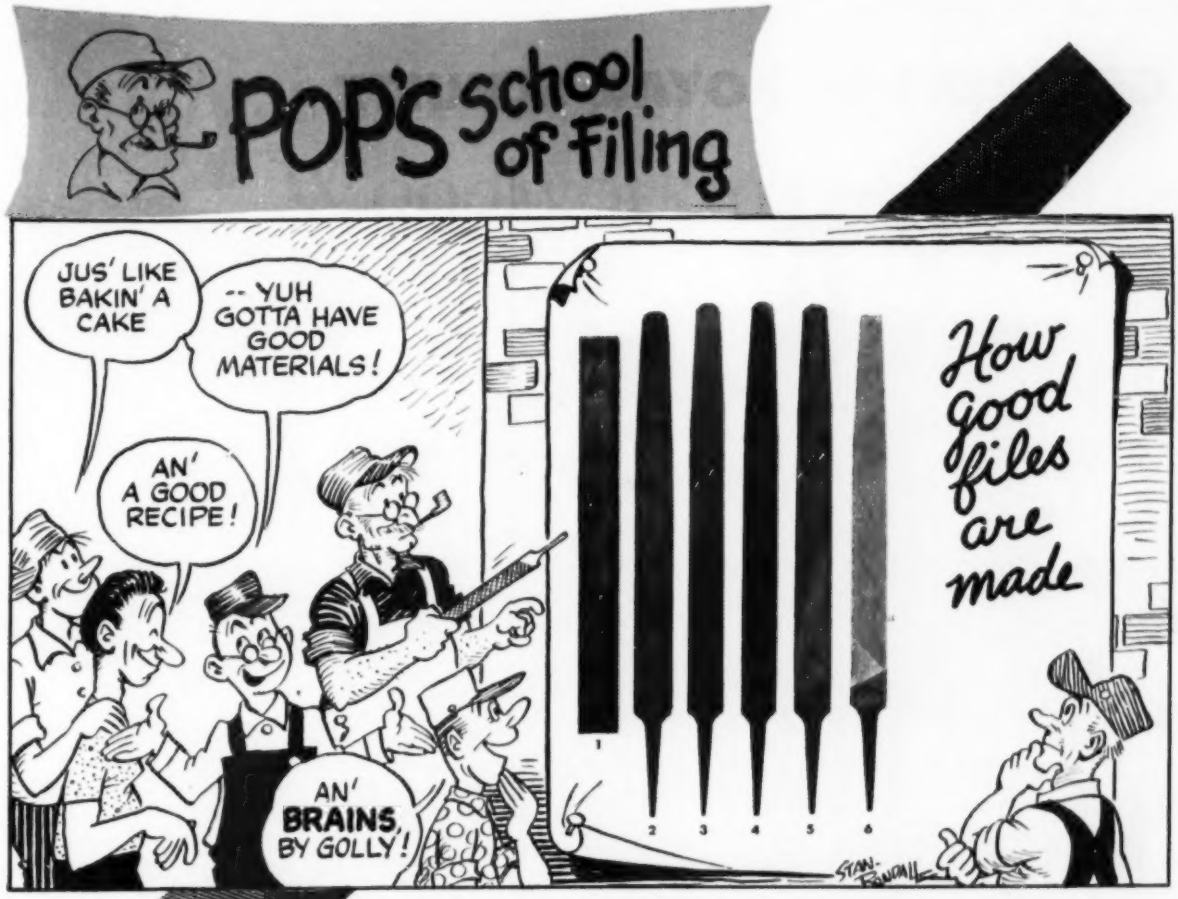

Making files of high and lasting quality, and of correct design for use on various kinds of materials and products, is a *science*. Nicholson manufacture goes far beyond the factory walls. It extends to the metallurgical laboratory, to the steel mills, to industrial plants where files are in constant or diversified use. Briefly, the steps embrace these important factors:

Steels are usually made to exacting specifications; come in bars of various cross-sections; are analyzed and tested; cut to working lengths (1).

Forging, with trip hammers, rollers and punches, shapes the body, point and tang into a "blank" (2).

Annealing, by heating that is laboratory-controlled for both degree and length, "conditions" the steel for uniform texture and for cutting.

Smoothing involves straightening the annealed blank, grinding to remove scale, and drawfiling to assure uniform teeth and even filing surface (3).

Cutting is done by Nicholson-perfected chisel-operating machines considered the most precise and efficient of their kind in the world. First operation (4) produces the overcut (single); second (5) the upcut.

Hardening is achieved under highly scientific processes and controls to assure teeth that are strong and hard yet not brittle.

Finishing (6) includes such important details as: cleaning and sandblasting for extra sharpness of teeth; softening tang; oiling to prevent rust; final-testing and checking to assure the most efficient, uniform and long-lasting files human skill and earnestness can produce.*

The use of Nicholson or Black Diamond files in the school shop helps training schools to give their graduates a good send-off.

***FREE** 48-PAGE BOOK, "File Filosophy," to school heads and instructors on individual requests. Tells lots more about the manufacture, kinds, use and care of files.*

NICHOLSON U.S.A. **NICHOLSON FILE CO. • 47 ACORN STREET • PROVIDENCE 1, RHODE ISLAND**

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BLACK DIAMOND MADE IN U.S.A.

NICHOLSON FILES FOR EVERY PURPOSE

GRINDERS by BOYAR-SCHULTZ

No. 2 PROFILE GRINDER

For grinding and fitting odd shapes and irregular contours such as the type found in air craft, automotive, locomotive and other heavy work. Made in two styles—Single or Dual Spindle. Spindles turn at 10,000 R.P.M. Wheel sizes, ½" to 3" diameter.

No. 1 PROFILE GRINDER

A bench type Grinder for saving time grinding odd and irregularly shaped surfaces; fitting dies and punches. Spindle turns at 20,000 R.P.M.

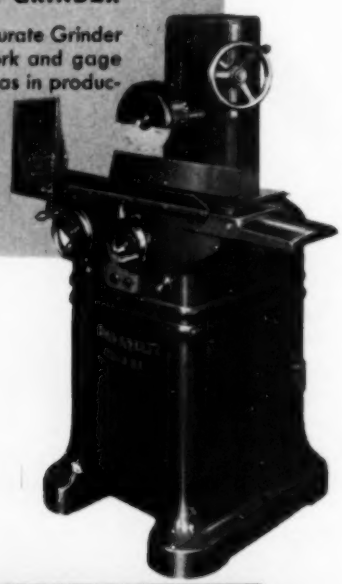
No. 6-12 SURFACE GRINDER

A precision Tool providing close tolerance performance associated only with larger and more costly grinders. It produces flatness, horizontal and vertical accuracy comparable with larger, more costly Grinders.

Self contained Dust Collector Unit furnished as optional equipment is built into a streamlined stand replacing the one regularly furnished. No additional floor space required.

6-18 SURFACE GRINDER

An extremely accurate Grinder for tool room work and gage grinding as well as in production. Rugged construction and superior design assure accuracy over a long time.



BOYAR-SCHULTZ GRINDERS IN THE TOOL ROOM AND DIE SHOP . . . have won a most enviable reputation for accuracy where accuracy counts most. They are dependable . . . the favorite machine tools with skilled mechanics who KNOW how a fine tool must perform.

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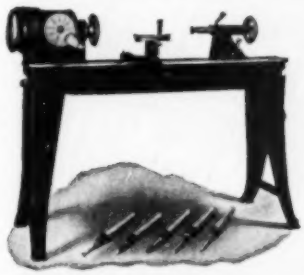
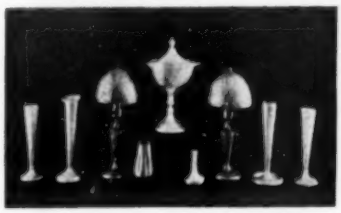
Increase students' skills with "Oliver" Woodworking Machinery



"Oliver" Metal Spinning Lathe
— most helpful machine for any shop

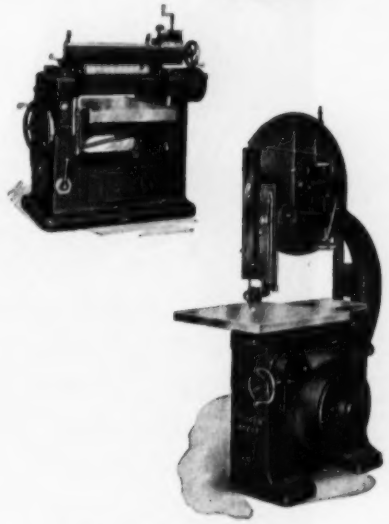
You can spin beautiful as well as useful vases, cups, trays, etc., from pewter, copper, bronze and other sheet metals. The "Oliver" No. 159M Metal Spinning Lathe is precision-built with extra heavy bearings to endure severe service. Has ball bearing variable-speed motor-driven headstock and live tail center. Swings 12" diameter, 24" between centers. Lathe can also be used for turning wood and soft metals.

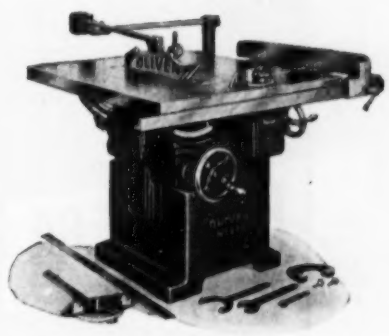


Used in over 2350 vocational shops to give the right training

TRAIN your students *right!* Use "Oliver" equipment. They'll enter industry with a sound training as a basis for rapid progress. In over 2350 vocational shops instructors *know* that their "Oliver" machines give more for the dollar in performance. They *know* these machines are built to endure hard usage year after year without flinching.

"Oliver" machines are designed for industry by engineers who realize the needs for thorough student training. They are easy to operate, and have the latest safety features. It doesn't take long for a student to learn to set up an "Oliver" quickly and accurately. Self-locking devices keep machines in perfect adjustment. The machines shown here are but a few of a complete line to make your efforts most effective.





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Tell us the machines that interest you, and we'll send you illustrated bulletins containing full details.

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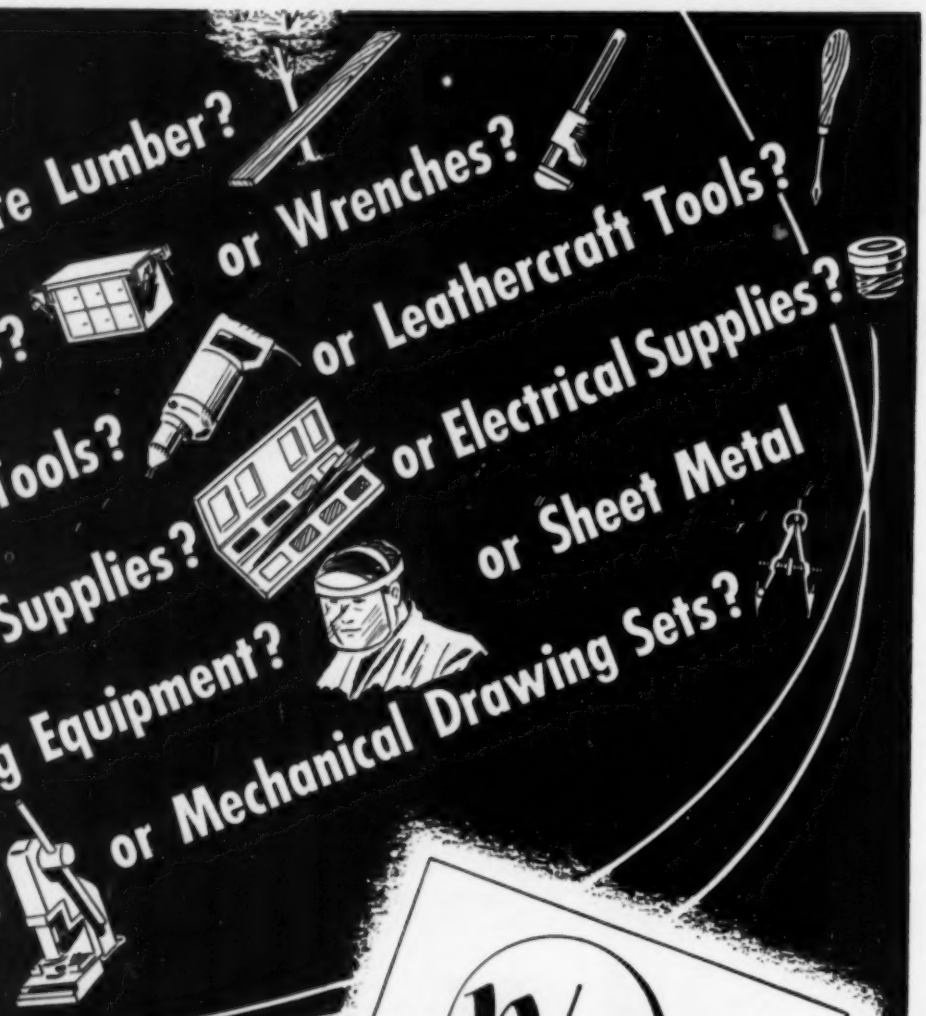

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The effect of Superiority

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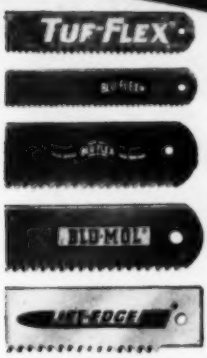
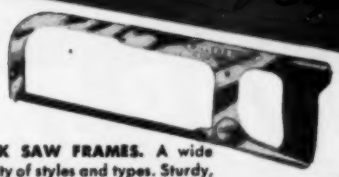


MOST HIGHLY DEVELOPED LINE OF METAL-CUTTING SAWS in the world. Includes "Blu-Flex"® and "Tuf-Flex"® hand blades, and "Blu-Flex"®, "Blu-Mol"® and "Jet-Edge"® for power sawing. Also metalcutting bands and hole saws.

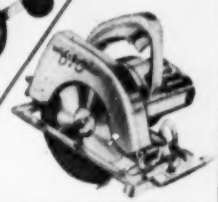


HACK SAW FRAMES. A wide variety of styles and types. Sturdy, well-balanced, with firm, comfortable grips — each an outstanding value in its field.

No. 725 "NEST OF SAWS" One of the handiest saws ever made. Cuts most anything — most anywhere. Three interchangeable blades turn and lock in 8 positions.

HAND AND BREAST DRILLS. Sturdy, smooth-running, built for a lifetime of fine performance. The favorites of experts for over half a century.

THE WORLD'S LARGEST SELLING QUALITY BRACES Traditional favorites of skilled craftsmen. Plain and ratchet models for every need.



NEW 6-INCH HEAVY-DUTY PORTABLE ELECTRIC SAW — No. 610. Does 90% of all ordinary sawing jobs. Full ½ h.p. motor. Also 7-inch, 9-inch, 10-inch models.

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No. 800 "DYNO-MITE"® HIGH-SPEED POWER BITS. Specially designed for use in hard or soft woods with ¼" electric drills. High-speed steel blades cut through wire nails without damage. Six sizes from ⅜" to 1".

MICROMETERS Produced for extreme accuracy and dependability. Part of Millers Falls wide line of machinists and precision tools.

PORTABLE ELECTRIC POLISHERS, SANDERS, GRINDERS. Fast, powerful high-production tools that speed up cleaning, surfacing and finishing operations. Light-weight, easy to use. Also heavy-duty bench and pedestal grinders.

No. 555 IMPACT TOOL Amazing new time saver. Runs, loosens and removes nuts or studs, taps, threads, drives screws. Compact, powerful, versatile. Cuts time up to 90% on many jobs.

No. 1814 ¼" ELECTRIC DRILL. Versatile, rugged general utility drill unexcelled for speed and power. Also ¼" spade grip drills, ½" drills, stands, accessories for sanding, polishing, grinding, cleaning, etc.

THE FINEST PLANES IN THE WORLD Many unique and improved features. Each built to highest standards in design, workmanship and finish. Complete line includes Block, Bench, Rabbet and Router Planes.

AUTOMATIC DRILLS For quick, one-hand, small-hole boring. A famous line known and preferred the world over.

No. 966 6-INCH SANDER-POLISHER with exclusive orbital attachment for finishing flat surfaces. Buffs, sands, grinds, polishes, waxes, wire-brushes, drills, mixes paints.

MILLERS FALLS TOOLS ARE BETTER THAN EVER

New and improved designs . . . finer materials . . . advanced production methods and techniques—all combine to bring you the greatest line of long-lasting, high-performance tools in Millers Falls 86 years of quality tool-making. Shown here are just a few. Write for new Utility Electric Tool Catalog . . . and a copy of Catalog No. 49 — 176 pages of better-than-ever Millers Falls Tools.

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"LANGDON ACME" and "ALL STEEL" MITRE BOXES For years, the mitre boxes preferred by professionals for fast, easy, accurate work.

STANLEY SHOP TALK

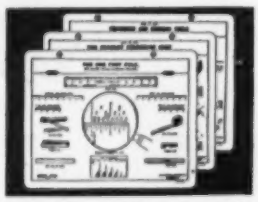
CATALOG No. 34

This STANLEY TOOL CATALOG with the special school index is a particularly useful book of reference and tool information for the shop teacher.

Packed with descriptive facts and hundreds of illustrations, it makes tool selection sure and easy. The handy school index recommends items found most useful and serviceable for school use. It is based upon STANLEY's long experience and the advice of educators.

Use the coupon to send for your free copy of the STANLEY TOOL CATALOG with special school index. We will include a 9-page list entitled *Suggested Specifications for Equipping A General Shop.*

INSTRUCTION CHARTS



Shop teachers find these STANLEY instruction charts real time-savers. They concentrate on show-how to build student know-how. Wordy description is cut to a minimum.

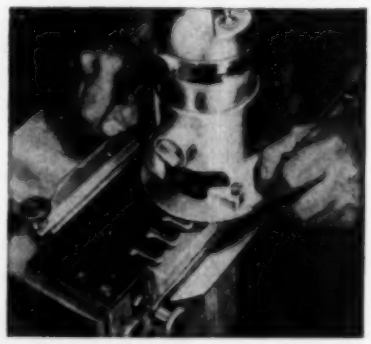
Each chart is printed on both sides of heavy, lacquered, extra large, 25" x 19" cardboard. There are 38 in the set, covering all the woodworking tools and seven of the more commonly used metal working tools. Complete set $6.00. Delivered anywhere in the U. S. A. Use coupon.

"YANKEE" PUSH DRILL

The Yankee "100 PLUS" No. 41. The mechanic's friend, this sturdy all metal tool is ideal for shop use. Bores smoothly with a one-hand drilling action. The drill point in use is locked in. Eight drills from 1/16" to 11/64" (by 64ths) are stored in the magazine handle.

DOVETAIL FIXTURE

The STANLEY No. 61. Used with the versatile and popular STANLEY R8A Electric Router, this dovetail fixture adds cabinetmaker skill to school shop woodworking. The dovetail joint for drawer fronts is cut simultaneously on the front and side piece in a few seconds with the electric router and this attachment. Order the new router manual, *The Router—What It Is and Does.* 38 pages of information with more than 100 illustrations. Regularly 50¢, only 35¢ to schools.



Use this coupon for more detailed information and school shop help

STANLEY Tools®

HARDWARE • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

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FREE ( ) Please send me Stanley Tool Catalog No. 34
FREE ( ) Please send me Stanley Electric Tool Catalog
FREE ( ) Please send me "Yankee" Screw Driver Chart No. Y43
( ) Please send me one set of Instruction Charts at $6.00 per set, postpaid
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NAME.....

SUBJECT YOU TEACH or POSITION.....

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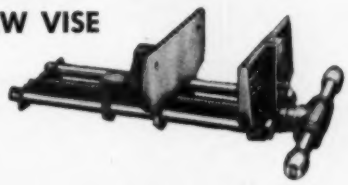
For your Woodworking Classes

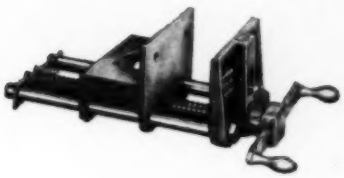
SOLID NUT CONTINUOUS SCREW VISE
Hardwood Handle

The simplicity of construction insures service under the most severe wear. Interchangeable cold rolled side bars threaded and held in place by hexagon nuts – not riveted. With stop in front jaw.



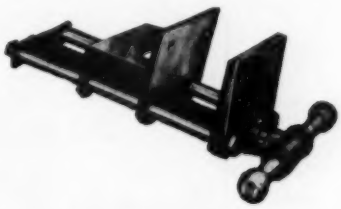
SOLID NUT CONTINUOUS SCREW VISE
Adjustable Steel Handle

Extra heavy cold rolled screw and solid nut. Careful machining of all parts. Firm, always parallel gripping power. Stop in front jaw for extra convenience.



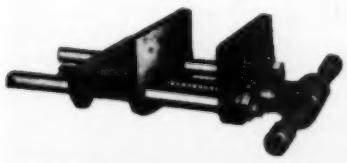
JUNIOR WOODWORKERS' VISE

Solid Nut Continuous Screw Woodworkers' vise with stop in front jaw. Made of semi-steel castings. Hardwood handle.



QUICK ACTION VISE

Most simple and effective of the screw adjusting type vise. Intercepted threads on the screw operate in a half nut. Offers speedy gripping power. High quality bronze half nut. Carefully machined working parts.



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With Morgan vises, continual breaking-strain tests and uniform high quality semi-steel castings are your assurance of lifetime, guaranteed sturdiness that withstands daily student wear and supplies you with continuously dependable service.

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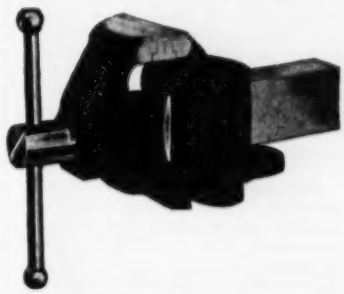
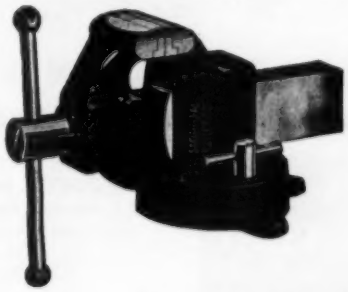
120 N. Jefferson St. Chicago 6, Illinois

For your Metalworking Classes

MACHINISTS' BENCH VISE
Solid Jaw and Stationary Base

Special semi-steel casting. Sliding bar's accurate milling means a snug fit of the broached base opening. The solid steel forged screw has a malleable iron acme threaded nut. A lifetime, rigid-gripping vise.





MACHINISTS' BENCH VISE
Solid Jaw and Swivel Base

May be swung and clamped in any desired position. A specially designed nut locks the base. No play despite heavy duty. Unusual rigidity and strength for a swivel base vise.

COMBINATION PIPE VISE

Constructed to embody the best features of the standard machinists' vise and the convenience of a pipe vise. The pipe jaws are milled from high grade tool steel. The vise jaws have hardened tool-steel faces.

May I start by introducing myself? As you can see from the title, they call me Sparky. I'm what you might call a trade character and I serve as official spokesman for Marquette products.

Right now there's a tremendously important job to be done. You people in the schools and training shops have the responsibility of training large numbers of skilled, efficient workers for industry. The Marquette people have the responsibility of providing the most up-to-date equipment and materials, both for training purposes and for maintaining industrial production.

When it comes to developing welding skill, modern equipment is as indispensable as competent instruction. Only equipment that has kept pace with the many advances in welding technology can prepare the trainee to meet today's high standards of workmanship. It is such equipment—outstanding in modern simplicity and efficiency — that Marquette places at your disposal.

Marquette AC Instant Arc Welders are a triumph in modern engineering. The last word in design, construction and performance, they will weld any metal that can be welded. They are easy to use, positive in arc action — **silent**, stable, full of power.

Marquette Oxy - Acetylene welding and cutting outfits, equally outstanding and up-to-the-minute in the field of gas welding, come in a number of sizes and combinations to meet all requirements, including aircraft cutting and welding.

Throughout the complete Marquette line of welders, electrodes and accessories, is found the same high level of quality that has earned Marquette its international reputation. The same know-how that has created the Marquette line is available to you in field service if you would like help on a personal or shop welding problem. Use the coupon as your first get-acquainted step. Liberal educational discounts.

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VARIABLE SPEED LATHES 640 to 3550 rpm. Swing over gap 15½", over bed 13" distance between centers 38"

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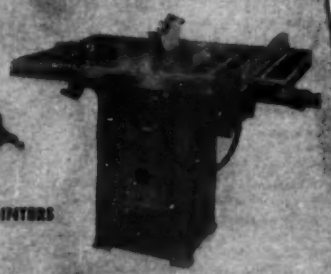

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NEW 16" BAND SAW with Variable Speed Drive. Cuts both Wood and Metal.

We're frank to admit it—Walker-Turner LIGHT-HEAVYWEIGHTS are designed with an eye to the school market. As a result, the school's shop—and students—stand to benefit. Because all LIGHT-HEAVYWEIGHTS are engineered

—with appropriate and proved Safety Devices specifically designed for each tool

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Call your nearby factory-trained Industrial Distributor to demonstrate the advantages of safety-engineered LIGHT-HEAVYWEIGHT Machine Tools. Or write us direct.

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DRILL PRESSES — Hand and Power Feed • RADIAL DRILLS Wood and Metal Cutting BAND SAWS • TILTING ARBOR SAWS RADIAL SAWS • JIG SAWS • LATHES • SPINDLE SHAPERS • JOINTERS BELT AND DISC SURFACERS • FLEXIBLE SHAFT MACHINES

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Prices F.O.B. Detroit—subject to change without notice. Write for further information about Jam Handy Films. These films may be purchased through a nationwide dealer organization.

TOOL ROOM OR PRODUCTION—
SPEEDS FOR CARBIDE TOOLS—
MEDIUM SIZE CAPACITY—

With FEATURES AND RANGE NORMALLY FOUND IN LARGER LATHES

Usually only in larger, more costly machines do you find the combination of speeds, swing, power, feeds and threads that are standard equipment on Rockford Economy Lathes. These features make it possible to machine a wider range of work with fewer non-productive hours than is possible with many machines in its class.

Medium-sized and economy-priced, it's built to handle any job that can be turned or threaded within 16-1/2" or 18-1/2" swing, and 30" to 102" center distance. 3100 lbs. of weight, 6' bed and zero precision bearings furnish the rigidity and precision for turning out tool room accuracy.

Ask a Rockford Machine Tool Co. representative to give you full details on these machines, or write direct for our new bulletin No. 900A.

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MEDIUM-SIZED
ECONOMY-PRICED

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ROCKFORD MACHINE TOOL CO.
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For Long Satisfactory Service

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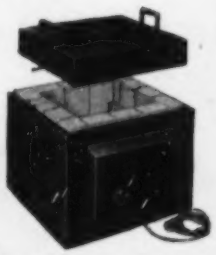
EQUIPMENT

Look at These Features and Compare

Hotpack KILN KIT

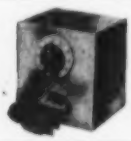
EVERYTHING YOU NEED TO MAKE THIS PROFESSIONAL LOOKING ELECTRIC KILN



LARGE CHAMBER:
12" deep, 11" wide, 9" high

YOU GET: Illustrated instruction Manual, Insulating Back Up Material, Insulated Cover & Handle, Wire — Screws — Terminal Board, Insulating Brick — cut to size, Sheet Metal Case — welded & painted, Hotpack Heating Elements, wired, 15 amps — 115 volts — Ready to install.

Prices including Freight and Crating:
East of Denver — $48.00
West of Denver — $55.00



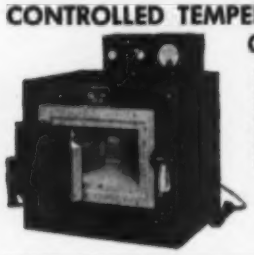
YOU NEVER FORGET to turn off your kiln with the

HOTPACK LIMITOR

Plug-in Type, 115 v. — $14.95

Wire-in Type, 220 v. — $27.95

CONTROLLED TEMPERATURE KILNS FOR ENAMELING ON COPPER



These units provide manual adjustment of temperature for kilns. They may be regulated so that current may be supplied to the kiln for any percentage of time per minute. This method of selection provides exact temperatures because the slightest movement of the control knob will vary the time of input, thereby raising or lowering the temperature as desired.

Model	Interior Size	Price F.O.B. Phila.
7069	12"x12"x5½"	$140.00
7066	8"x 8"x5½"	100.00

Hotpack ELECTRIC CERAMIC KILNS

Designed for Use in Art Courses in the School

1. Eye level controls — pilot light.
2. Built-in pyrometer for visible accurate temperature indication.
3. Handles are cool to touch.
4. Control switch — low, medium, and high heat for even distribution.
5. Special insulation holds heat and prevents scorching of table top.
6. Maximum temperature 2050° F.

SPECIFICATIONS

Model No.	Interior Size	Shelves Furnished	Approx. Time	Characteristics, Electrical	Price F.O.B. Phila.
7006	8"x 8"x 5½"	1	3 hrs.	115 V-15 Amp.-1700W	$ 65.00
7004	8"x 8"x11"	2	4 hrs.	115 V-15 Amp.-1700W	$ 95.00
7005	12"x12"x11"	2	3 hrs.	220 V-23 Amp.-5000W	$205.00
7007	15"x15"x16½"	3	4 hrs.	220 V-30 Amp.-6600W	$410.00
7009	12"x12"x 5½"	1	4 hrs.	115 V-15 Amp. 1700W	$105.00

Enameling on copper can be efficiently fired on our models No. 7006 and 7009 due to the fact that they are designed with removable shelves and also the firebrick insulation permits thermal shock at normal enameling temperatures.

No. 600

Hotpack PLASTIC PRE-HEATING EQUIPMENT

ELECTRIC PORTABLE OVEN

For preheating Methyl Methacrylate in sheet or rod form where it is necessary to maintain even temperature throughout the sheet, especially desirable in compressed air, vacuum, or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 306° F. is desired.

Due to the aluminum construction, the Oven is very light in weight and can be carried from room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

SPECIFICATIONS

Model	Interior Size	Exterior Size	Wattage 110V AC-DC	Shipping Weight	F.O.B. Phila. Price
600	12"Wx12"Dx12"H	16"Wx19"Dx24"H	700	60 lbs.	$ 75.00
602	24"Wx12"Dx12"H	28"Wx19"Dx24"H	1400	110 lbs.	$125.00

THE Hotpack ELECTRIC PLASTIHEETER

Designed for Use in Plastic Courses in the School

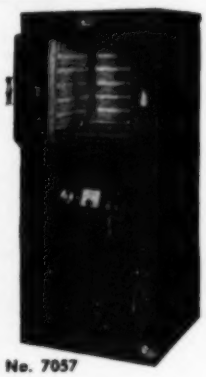
The HOTPACK PLASTIHEETER is a commercial type strip heater designed to heat sheets of Plexiglas or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ½" thickness in from 30 seconds to 4 minutes depending on the thickness of the material. As the material does not come into contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

No. 15

SPECIFICATIONS

Model No.	Working Space	Overall Size	Wattage 115 Volt	Shipping Weight	Price F.O.B. Phila.
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H	200 W	4 lbs.	$15.00
16	30"Lx5"Wx2½"H	32"Lx7"Wx3½"H	350 W	6 lbs.	$25.00

Hotpack ELECTRIC HEAT TREATING FURNACE



No. 7057

For hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

This new Hotpack Electric Furnace is fast heating — built for continuous use from 300° F. to 2000° F. It is the only furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limitstat control in this price field.

SPECIFICATIONS

Model	Interior Size W. D. H.	Current Characteristics	Shipping Weight	Price F.O.B. Phila.
7076	8"x 8"x 5½"	110 V-AC-15 Amp.	180 lbs.	$230.00
7074	8"x 8"x11"	115 V-AC-15 Amp.	200 lbs.	$255.00
7075	12"x12"x11"	220 V-AC-23 Amp.	350 lbs.	$370.00
7077	15"x15"x16½"	200 V-AC-30 Amp.	550 lbs.	$575.00
7079	12"x12"x 5½"	110 V-AC-15 Amp.	250 lbs.	$265.00

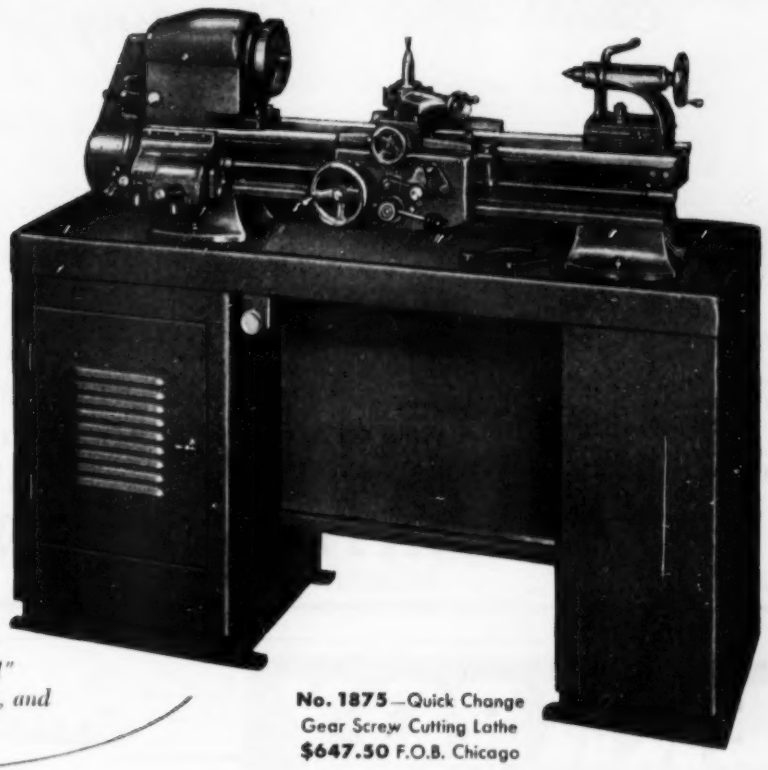
SEND FOR COMPLETE INFORMATION OR CATALOG

THE ELECTRIC Hotpack COMPANY, INC.

5067 COTTMAN AVENUE • PHILADELPHIA 35, PA.

THIS Logan 10" SWING * LATHE

TRAINS THE STUDENT ON A STANDARD INDUSTRIAL TOOL



* *One of the many in the complete Logan line of 9", 10", 11" and 12" swing Lathes, and 8" Shapers.*

No. 1875—Quick Change Gear Screw Cutting Lathe
$647.50 F.O.B. Chicago

Brief Facts

Swing over bed, 10½"
Center Distance, 24"
Bed Width, 6 13/16"
Ball Bearing Spindle
Spindle Hole, 25/32"
16 Spindle Speeds, 38 to 1230 rpm
Double V-belt Drive for extra power to spindle is completely enclosed
Threads—46 selections, RH or LH—4 to 216 per inch

The No. 1875 equips the metalworking teacher to train the student on one of American industry's standard machine tools. This trim, compact, 10" swing Logan Lathe is built with advanced design features and to precision standards outstanding in its field. Its spindle turns on pre-loaded *ball* bearings of extreme precision, so adaptable to all speeds they need no adjustment in the full range of 38 to 1230 rpm. The automatic apron, double-walled and friction-free, with spline driven power cross feed, has a convenient, lever-operated disc-type clutch. The two V-ways and two flat ways of the heavy-ribbed, special alloy bed are precision ground to within .0005" of perfect alignment. At vital wear points self-lubricating bronze bearings minimize friction and sustain accuracy.

For the student's safety, V-belt drive, headstock, countershaft and motor are enclosed. Controls and switches are easily accessible. The compact, space saving design is ideal for multiple installations. The low price results from the major savings of finer tooling and efficient operation in the modern Logan Plant.

Write for the Logan Lathe Catalog

Logan ENGINEERING CO.
Lawrence and Lamon Avenues, Chicago 30, Illinois

LOOK TO Logan FOR BETTER LATHES AND SHAPERS

A MUST FOR EVERY SCHOOL SHOP

POWERMATIC Model E-16" PLANER

Check these outstanding features

- Complete cast iron construction with cast iron base.
- Dynamically balanced cutterhead turns 4500 R.P.M. with cutting circle of 4" to assure extra smooth finish.
- Complete variable feed range from 20 to 50 feet per minute.
- Table locking device keeps table from creeping.
- Fully guarded moving parts insure safe operation.

ONLY $580.00, LESS MOTOR

Write for complete descriptive literature

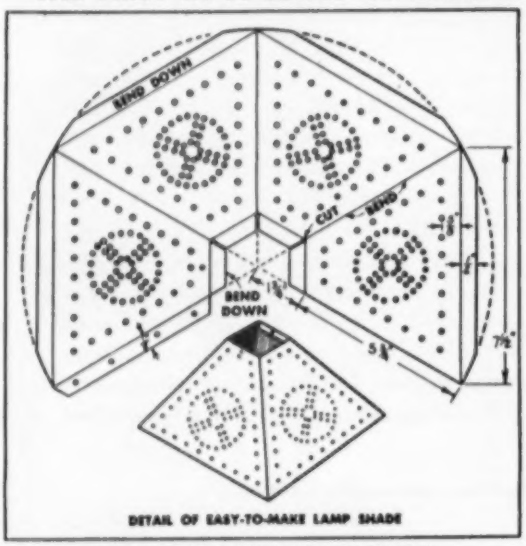
ALSO MANUFACTURERS OF CHAIN SAW MORTISERS, HOLLOW CHISEL MORTISERS, TENONERS and 12", 20" & 24" SINGLE SURFACERS

POWERMATIC MACHINE CO.

McMINNVILLE, TENNESSEE

BERKROY *Presents . . . .*

THE FIRST IN A SERIES OF SHEET METAL PROJECTS MADE WITH BERKROY EQUIPMENT

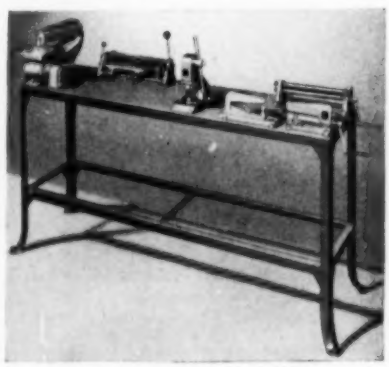


DETAIL OF EASY-TO-MAKE LAMP SHADE

Many delightful projects can be developed easily and accurately with Berkroy sheet metal tools.

The easy-to-make lampshade illustrated is an attractive beginning project, and dimensions are given and bends indicated in plan view. Layout lamp shade on a sheet of 20-gauge metal, do not allow much margin between the pattern and the edge oft he sheet.

With your NIBBLER, cut along the outside line shown in the pattern. This will give you a shape that is almost a full circle. Make the cuts along the two edges of the shade to complete roughing out the project.



Cut out the top of the lamp shade (center of the patternr) as marked. If you have difficulty in making the straight-line cuts without backing out, cut this section in a curve and straighten by nibbling away the edges. Make the tab cuts that are required so that the edges can be folded under. Use your BERKROY BRAKE to make the required bends to finish all edges. PUNCH the rivet holes as marked to hold the clamp for the lamp shade. (Such clamps can be purchased for a few cents at most electric stores.)

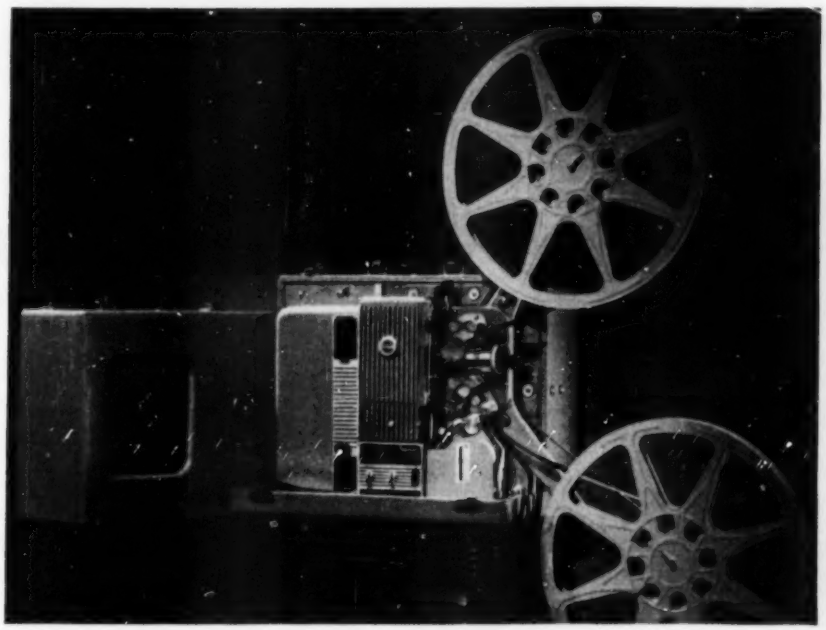
The punched design in the sides of the lamp shade as shown in the pattern is merely a suggestion, as almost any design can be punched or cut in the sheet. You may want to substitute initials or a cut-out figure.

Finish the project by making the final bends to bring the lamp shade to shape. Rivet or solder the two edges and attach the clamp. Finish as desired.

WRITE FOR FREE CATALOG INFORMATION

BERKROY PRODUCTS CO.

2516 NO. ONTARIO ST. BURBANK, CALIF.



Projector Runs Equal of 2½ Years Without One Drop of Oil!

"Operation 1000" proves projector lubrication a problem of the past . . .

1000 hours of projector operation is equal to *two and a half years* of hard, steady use in the average school. That's a lot of projection time—enough to show more than *2 million* feet of film. And it's a lot of time for a projector to run without breakdowns, adjustments, or maintenance . . . without even a single drop of oil. *Only one sound projector could do it—the Kodascope Pageant!*

Dealer proves the point

An amazing public test conducted by the Colorado Visual Aids Supply Co. of Denver, Colorado, has proved that the Pageant can stand up to just such a grueling ordeal . . . *and come right back for more!* Two Kodascope Pageants, selected at random from stock, were run *constantly* for 1000 hours . . . day and night, week after week, for a whole month and a half without a minute's rest.

And they took the punishment every second of the time!

How did the Pageants perform *after* this grueling endurance test? "Just like brand new!" says Mr. Hal Guzofsky, Manager of the Colorado firm. "The mechanisms operated as smoothly and quietly at the end of the run as the day we set them up!"

The amazing results of this test were possible because of an exclusive Pageant feature—*permanent pre-lubrication.* Among all 16mm. sound projectors, *only* the Pageant has this feature to eliminate the chief cause of projector failures—under- or over-oiling.

Other plus features

In addition, *only* the Pageant offers you all of these important advantages . . . Fidelity Control for precise sound focusing . . . nylon gears and a silicone-damped roller to prevent distracting projector noises . . . built-in field-sharpening element . . . *true-rated* amplifier for full power delivery . . . and a portable model specially tailored for every 16mm. need—with each model the *lowest priced* in its field.

How "OPERATION 1000" was conducted

1. UNDER WAY—After attaching a meter to record the number of hours of continuous operation, Ralph B. Mayo of Mayo & Company Certified Public Accountants, turned on the projectors and *sealed* them in operating position.

2. FULL PUBLIC VIEW—One Pageant was placed in the Colorado Visual Aids Supply Company's display window . . . one inside the store. Under CPA supervision, both ran *continuously* throughout the test without maintenance or lubrication.

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
The Shop Teachers' Professional Magazine

MARCH 1954

Community Co-operation in School Shop Planning

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Shop work as an organized school program had barely begun to take shape fifty years ago. Since that time it has made phenomenal progress as an accepted phase of public education. This is true for both industrial arts and vocational education, both of which have been matured and given separate status, mainly since the turn of the century. Their acceptance is taken as a matter of course, both by school administrators who plan curricula and the taxpayers who pay the bills.

Nowhere is the evidence of this acceptance and progress more noticeable and striking than in the area of housing and equipment. Many teachers are still on the job who remember the room in the basement as a rather normal location for shopwork; where often less than 25 sq. ft. per student was available for active work, with practically no storage facilities and other auxiliary rooms and services now considered essential and usually granted in modern shop construction. The march from the basement room to the layouts of the present era is, of course, a corollary to the accepted philosophy for industrial arts and vocational education and is a fascinating story, in connection with the leaders who have developed and implanted that philosophy, but that story cannot be included here.

Evidences of Improved Housing

Examples of increase in floor space for school shops may be found in abundance in various recent publications as well as through personal visits. The publications fall into two general classifications: (1) recommendations brought forth by groups and committees appointed by local boards of education, professional associations, or working under State Departments of Education, and (2) evidence of actual accomplishments as presented in general and special issues of professional journals and other publications. Among the former of these may be mentioned a bulletin entitled, *Guide for Housing and Layouts of School Shops in California*, published by the California State Department of Education in 1950; and another, *A Guide for Industrial Arts Shop Planning*, State of Ohio Department of Education, 1949. The former of these contains recommendations for 100 sq. ft. per student for the so-called "heavy" shops for industrial arts as *adequate* for the open work area alone, with 125 sq. ft. listed as "desirable." For vocational education "heavy shops" the recommendations are 150 sq. ft. and 200 sq. ft. respectively for the same type of shops. A cursory examination of the March issues of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine for the past several years, which feature school shop planning, will lead to the conclusion that such recommendations are not fantastic or unattainable. Many published floor plans prove that such provisions for space are becoming acceptable as desirable and justifiable.

Shop Planning as a Community Enterprise

Admittedly adequate floor space is a basic factor in planning a shop or a shop building. But many inexperienced teachers and supervisors, and some with experience, fail to realize that it is only a starting point, and herein lies a danger which often leads into a tragedy in school shop construction. Unfortunately one need not travel far to find examples of lack of careful planning beyond this point. If taxpayers were to ask the question, "Did we get the best we could have had for the money invested?" how often could the honest answer to the question be in the affirmative? And even if the answer is "yes," has the community been made to feel a personal responsibility and sponsorship in the process?

The purpose of this article is to call attention to a little used source of value in school shop planning; namely, the generally unrecognized but powerful resources usually lying dormant in the community which may be tapped in connection with the solution of this problem of planning. This is recommended not as a substitute for other data of the type previously referred to, but rather as an added major source which will bring to the planning and to the educational program a degree of efficiency beyond the common approach.

Two advantages of an approach to the community are apparent: (1) a better planned shop or shop building and more suitable equipment for the money spent, and (2) what may be equally important, an understanding and appreciation on the part of taxpayers and community leaders of the operation of the educational program.

What Can the Community Contribute?

At the outset, attention might be called to the fact that it is a more painstaking process to attempt to draw upon community resources than it does to sit down and select what might appear to be a suitable layout used in another community or make a list of equipment and supplies from memory or imagination. For this reason, as well as others, it is necessary to start planning a shop building a long time before the final approval for it has been announced. Teachers who do the most complaining that they didn't get what they needed are often the ones who didn't realize their needs until they found them unfilled. So, here are some suggestions for procedure in letting the community in on school shop planning and, at the same time, getting lasting benefits from contacts with many people who are usually not consulted, or recognized in connection with school affairs.

Make a Community Survey

A survey in this case would not be the kind that involves imported experts and ten-page survey forms. It can be made by one teacher or committees of teachers organized as teams. The purpose of it would be to learn by direct contact facts about building and equipment of industrial and craft shops that might have application to school shops on one hand, and on the other, to become acquainted with the men who operate such shops. Selection would be by sampling of types rather than comprehensive covering in larger cities, while in smaller communities the visiting could be more complete. For vocational education the larger type of production plant would have special value, although the visitor would not have in mind direct duplication of layouts. For industrial arts particularly the smaller craft shops, novelties shops, and custom furniture shops should be given special attention. These are present even in the smallest communities, and it is a pity that, in many cases, industrial teachers do not seem to know that they exist. The following lists some types of establishments that might be visited, with suggestions for particular points of emphasis in the process.

The Modern Garage

1. Automotive teachers should make such visits frequently and perhaps they would recognize how far the average school auto shop is below a commercial shop in cleanliness of tools, clothing, floors, etc., as well as in organization and routing of work. Perhaps no other subject in school shopwork can get behind in both theory and practice as quickly as auto mechanics. Visits to a number of modern garages with a specific list of points to be observed would furnish much help that cannot be had from printed material.

Cabinet Shops

2. Every community apparently has custom furniture and wood novelties shops. These usually furnish more suggestions for school shops than large millwork establishments, unless the shop is for vocational classes in the latter field. In these smaller shops the latest in small machinery and the variety of its uses can be found. Methods of wood finishing in use may suggest abandonment of four coat rubbed varnish finishes still in use in school shops. The visit may even cause revolutionary changes in plans for finishing rooms.

Drafting Rooms

3. It seems to be taken for granted often that there is not much to be done to a drafting room except to get the necessary number of desks and units of drawing equipment. Meanwhile much firsthand information could be had about lighting, ventilation, storage, and other factors part of which might apply to a school drawing room.

Craftshops

4. Under this category fall a considerable number of different shops usually with limited output. Included may be metalcraft, metal spinning, ornamental ironwork, craft leather, toymaking, craft jewelry, wood carving, and many others. These shops will furnish ideas regarding possibilities in craft projects as well and since course content is the basis to shop planning, the vision of the entire program may be enlarged. Here again, new tools, new materials, new finishes, new ways of doing things will appear at every hand.

Home Workshops

5. Within relatively recent years the home workshop has made a marked impact upon the American home and upon the national economy. It would be a mistake to leave it out of consideration as a source for ideas in school shop planning, particularly for industrial arts. Here are two untapped sources: (1) an endless variety of small machines and other equipment, and (2) a similarly endless variety and ingenuity of their uses.

The foregoing will serve to indicate available contacts for firsthand knowledge of community activities. To these may be added many others, depending upon the size of the community and the variety of its industries.

The suggestions so far have indicated a passive co-operation by the community. The following paragraphs will discuss another phase of co-operation involving a more active contribution.

Local Advisory Committees

Local advisory committees have been used in the field of vocational education for many years. More recently community groups have been consulted spasmodically in scattered communities with reference to major issues in the operation of the public schools. Usually they remain outside of the operational area. Several reasons may be given why the community has not been kept more intimately connected with details of the operation of its schools; among which are the following: (1) the public usually shows very little interest in school affairs until some real or assumed problem arises; (2) it takes more time than is available on the part of school personnel to *cultivate* and inform the citizenship intelligently concerning details of school procedures; and (3) there probably is fear that if an attempt is made to keep the public informed on all issues, self-seeking individuals will arise to hamper normal operations of the schools. However, here are suggestions for using groups of citizens to assist in school shop planning.

1. Organize informal committees (after proper administrative approval) and solicit from them active assistance in the actual preliminary planning of shops and shop buildings.

2. Membership in such committees should come from different groups; employers, craftsmen, professional men (who may also be home workshop owners), boys' organizations, etc.

3. A committee may be organized for each of the subject areas proposed for the new school plant.

4. These committees would be encouraged to visit shop classes now in operation to become acquainted with the work and to picture future needs.

5. Specific points at which such committees could contribute would be concerning type and size of equipment; modern materials used in industry, building con-

struction, space allocations for routing of work, lighting, heating, tool storage; modern methods of production with special emphasis upon vocational education and to general phases of industrial arts; future educational values of courses offered with application to general values in industrial arts; adult education, and many others.

Such a program of community contacts as indicated here would need to begin a long time before the official planning had started. It must, of course, be carried out under full administrative approval. There would be little danger in my opinion that the program would be hampered. There should be more friends to defend it after completion. And who knows but what it might help to pass the bond issue if such an activity went on for six months or a year before the question came up for approval by the voters.

Shop and Technical Building, Milwaukee Vocational and Adult Schools

H. E. BARG
Business Manager
Milwaukee Vocational and Adult Schools
Milwaukee, Wis.

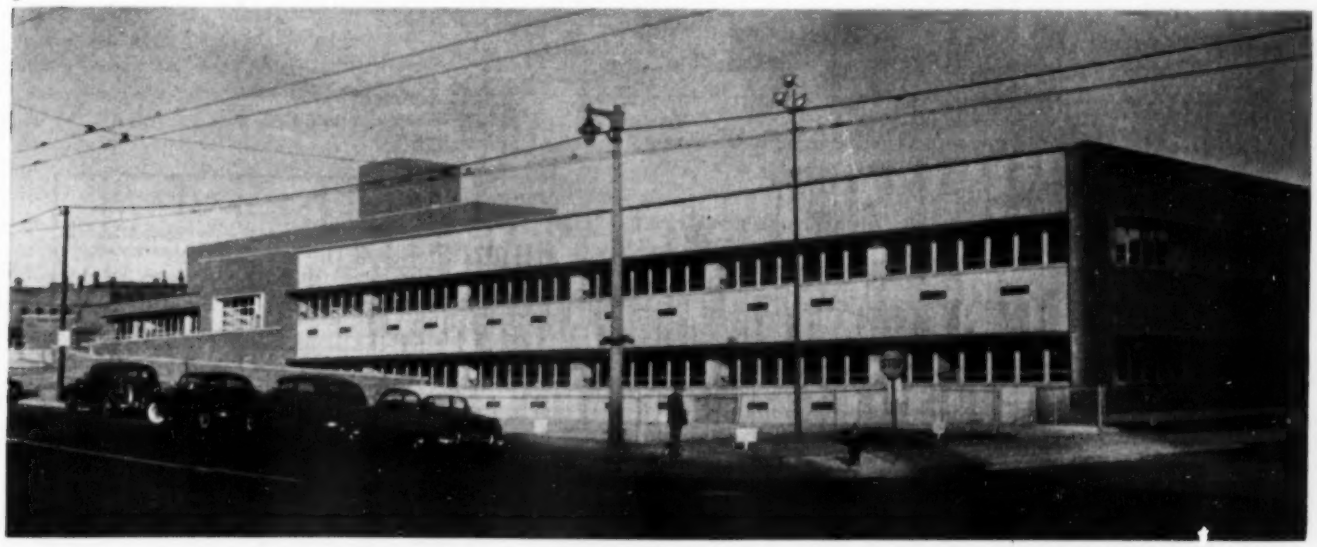
This fall classes were started in the new shop and technical building of the Milwaukee Vocational and Adult Schools. Much of the summer had been used in moving equipment and machines from the central building, installing them, and making the necessary service connections for electricity, water, gas, and air.

The steps followed in the development of the new building may be of interest and of some value to those who are contemplating similar expansions. For several years it had been known that more appropriate facilities were needed for heavy machines and certain other shop equipment. The main central building is a six-story structure covering a city block. In many ways it is still a modern functional building though designed 35 years ago. With the passing of time many new, higher speed, and heavier machines have been made available. Also there are now new activities with special requirements.

For a period of over eight years parcels of land had been purchased from time to time as available in the city block to the north of the main central building. Finally all but two small parcels in the entire block were acquired. One of the two parcels was acquired before condemnation and the other while proceedings were in process.

Select the Architect

Two consulting engineers were selected to assist the board in selecting an architectural firm. Questions and specifications were developed and sent to several firms of architects inviting them to appear before the board and consultants. The ques-



The new shop and technical building of the Milwaukee Vocational and Adult Schools

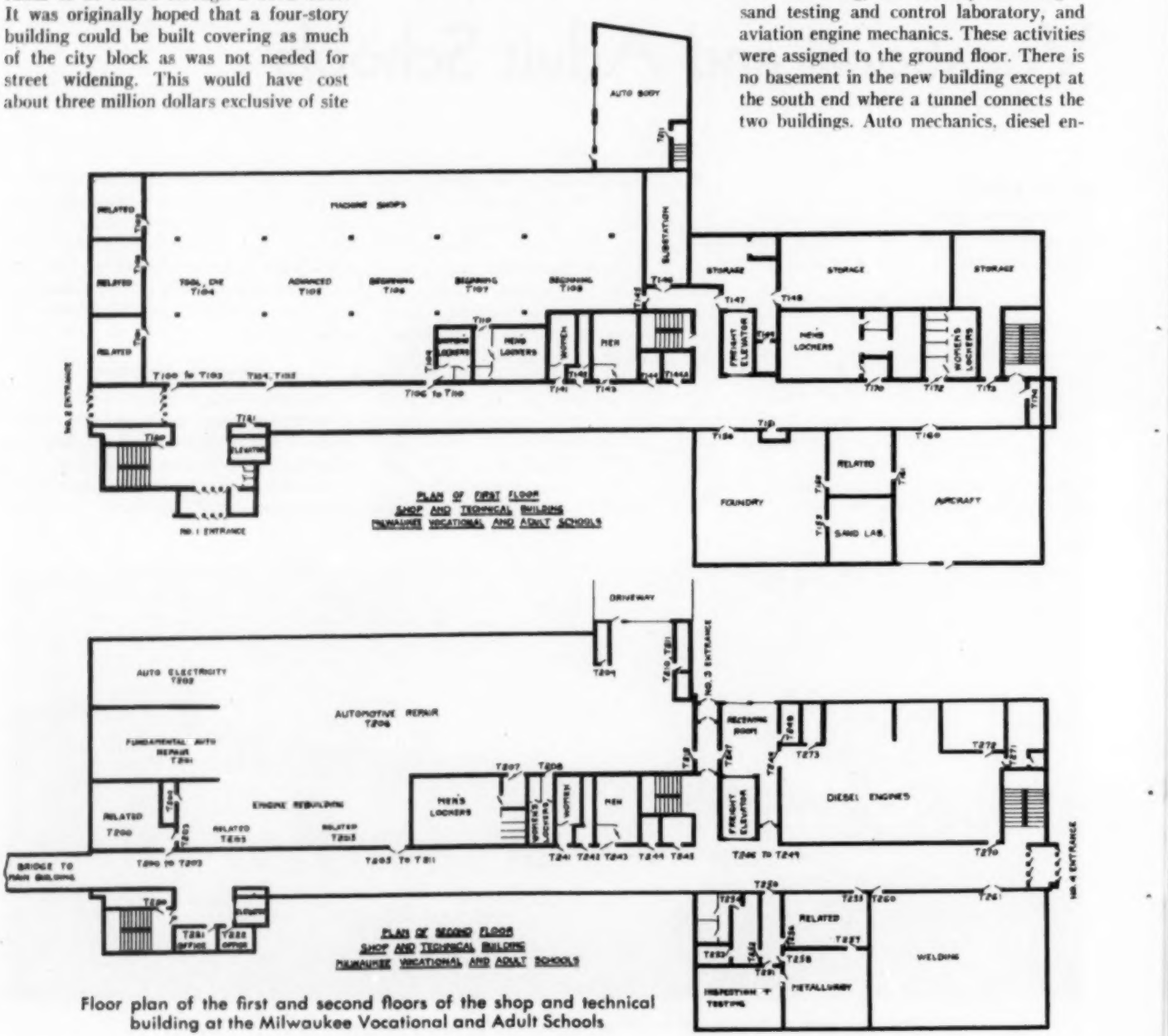
tions were chiefly around their experience with similar buildings, adequacy of staff, and proposed procedure in developing plans and specifications. The local firm of Grassold and Johnson was selected. The contract with the architects carried the provision that board approval was required for any consultants the architects wished to retain for the several branches of work.

We had worked with the city planning department to learn of their future plans for the development of this portion of the downtown civic-center area, and with the city engineer for permanent grade elevations; also with the Common Council for funds to be raised through a bond issue. It was originally hoped that a four-story building could be built covering as much of the city block as was not needed for street widening. This would have cost about three million dollars exclusive of site and equipment. So many capital improvement demands were being made of the city that the Common Council felt it could provide only one and a quarter million at the time for space most urgently needed, and that the board make any additional funds available through its two mill permissive tax. This resulted in finally building about three fourths of the first two stories with foundations, structure, and service provisions for four stories at a cost of one and three-fourths million.

Studying the Subsoil Conditions

A preliminary preparation step considered advisable was a study of subsoil conditions. A specialist in soil engineering was retained to study soil conditions and make a report to the engineers responsible for the basic foundation and structural design. Since the site was at the edge of what was originally a swamp, a comprehensive study was made. This included borings of a type where the samples taken every 5 feet contained the moisture as it existed at the point of sample. Cast-in-place piles were recommended and used. Each pile shell was driven to a thirty-ton loading and in clusters according to load requirements.

At this stage the activities were selected for transfer to the new building. They were the machine shops and tool and diemaking, the foundry including a sand testing and control laboratory, and aviation engine mechanics. These activities were assigned to the ground floor. There is no basement in the new building except at the south end where a tunnel connects the two buildings. Auto mechanics, diesel en-



Floor plan of the first and second floors of the shop and technical building at the Milwaukee Vocational and Adult Schools

gines, welding, and metallurgy were assigned to the second floor. The north end of the site for the new building is at an elevation equal to the second floor of the main building. The two buildings are connected by a bridge at the second floor level. The sides of the bridge are a continuous series of windows giving a light airy appearance. The variation in elevation permitted driving into the auto shop from the street on the west side, and adjacent to this there is a receiving area. Wide areaways give the first floor light at the north end except under the diesel shop where provision was made for storage. The tunnel and bridge tie the two buildings together so they may serve as a unit and facilitate the movement of students from one building to the other. This was considered especially desirable in this busy downtown section of the city.

Determining the Space Needs of the Shops

Another preliminary step was the planning of space and service requirements for machines and equipment. With the exception of a limited number of new machines and pieces of equipment that could not be accommodated in the main building because of space or weight limitations, most of the units were to be transferred. We therefore had the advantage of experience in the main building. The faculty, supervisors, and administration worked together on this problem. Work sheets were developed to determine the kind and quantity of service requirements for each shop. Drawings were made for each shop and scale cutouts of equipment placed on these outline drawings to give the maximum of efficiency and convenience.

The reports and drawings were given to the architects for them to develop preliminary sketches. They then worked with space and service requirements, the contour of the site, spaces to accommodate shop areas with a minimum of column interference, load requirements, and the design of the building.

In the early stages of planning it became apparent that special problems existed. Both school and factory codes were found to be applicable. The architects' experience in building both schools and factories was drawn upon to solve some of the problems. All the requirements had to be met within a given sum of money without sacrificing quality or essential features.

After seven preliminary plans were studied by school personnel and the architects, it was considered that the optimum had been reached within the limiting factors applicable. The original contract with the architects had called for preliminary plans only, leaving the option with the board to enter into a contract for detailed drawings, specifications, and supervision. The preliminary work was considered acceptable and the same architectural firm was engaged to complete the work.

As the work progressed there were a continuing number of problems to be settled. Throughout the preliminary and succeeding stages of work Dr. Wm. F. Rasche, director, was a key person. His rich experience in school administration and unusual ability in analysis contributed significantly in problem solution as well as in anticipating situations that otherwise would have become acute problems.

The architects were asked to check each stage of the work carefully for economy and ease of operation and maintenance. For instance, windows were selected that can be washed from the inside. Toilets are wall suspended. The walls are of structural glazed tile to a height of 7 feet throughout the building except in storage areas. Low brightness lights were decided upon not only for the quality of light but ease of maintenance.

Bus ducts were provided in the machine shops and in tool and diemaking to provide 220 a.c., 230 d.c., and 110 volts. This continuous shop area is divided into five shops. Storage cabinets set on islands serve to divide the shops. At the south end three related classrooms are set off with *borrowed-light* partitions. The individual student desks in these rooms are provided with large tops to accommodate the books and papers required. There are over a hundred machines in these shops. Flush lockers are provided in the halls. The machine shops have their own locker rooms, showers, and toilets. Welding, metallurgy, foundry, and aviation mechanics use a common locker and shower room.

Heavy diesel engines are in the crane bay for ease of servicing. This shop has its own related classroom, locker, showers, and toilets. The *borrowed-light* partitions permit its use as a one- or two-man shop. Welding is a two-man shop to accommodate either one or two instructors depending on the time of day or week. The various types of gas, electric, and resistance welding are taught in this shop.

Metallurgy has a related classroom, heat-treating section, a testing section, and a section for metallography. Each section is divided by borrowed-light partitions so one or more instructors can be used.

In the foundry there are areas for core work; melting units, electric, gas, and a cupola; molding, and a separate room for sand control work. There is a related classroom used jointly with the air engine mechanic shop.

Air engine mechanics is an approved C.A.A. course. The equipment and course of study are prescribed by the C.A.A. who make periodic inspections.

The unit system of heating and ventilating was selected for use throughout the building. Code requirements for different shops made this seem advisable. Steam from the main building provides heat.

In the auto shop, areas are set off by tool panels and storage cabinets to provide for live work, basic mechanical, and electrical work. An auto body shop is housed under the ramp leading to the auto shop.

A large freight elevator and a passenger elevator are additional services. A storage area adjacent to the freight elevator provides auxiliary storage for shops, and another for maintenance and custodial work. Special exhaust systems were designed to meet the needs in each of the several shops.

Employing a Special Supervising Engineer

Several weeks before construction was started a resident engineer was employed. This preliminary time was spent checking and co-ordinating the plans and specifications for the several branches of work. He studied the shops as they were in the main building to become familiar with requirements. Many costly extras were avoided in this way. He was employed by and paid by the board although he co-ordinated his work closely with the architects whose field superintendent had several jobs to follow. It was also felt this work required the full attention of an experienced and qualified person.

Preparation for moving to the new building was extensive. The layout of shops was made. Machines were numbered and located. Small tools and supplies were inventoried, boxed, and numbered. During the summer several weeks were required for moving, setting machines, and connecting services. This was done while construction work was going on, necessitating careful co-ordination with other contractors.

Presently the building is in full operation from 7:15 a.m. until 9:30 p.m. and on Saturday mornings for special courses in pipe welding. Several types of students are served: those following Institute of Technology courses, adult special students, apprentices, and continuation students. The space vacated in the main building is being remodeled to provide additional space for some activities and for the functional relocation of others.

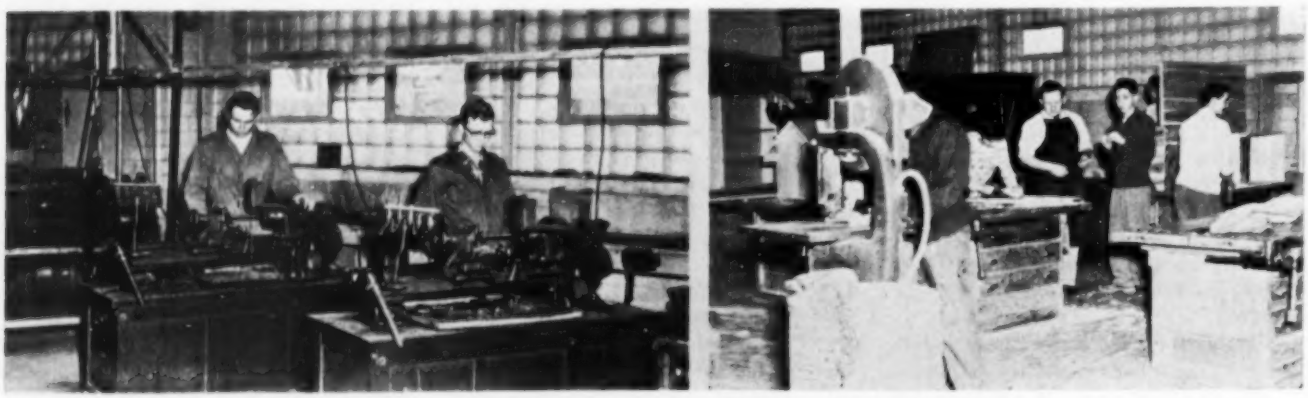
The New Industrial-Arts and Vocational-Agriculture Building

DELL REED
Instructor of Industrial Arts
High School
Liberal, Kans.

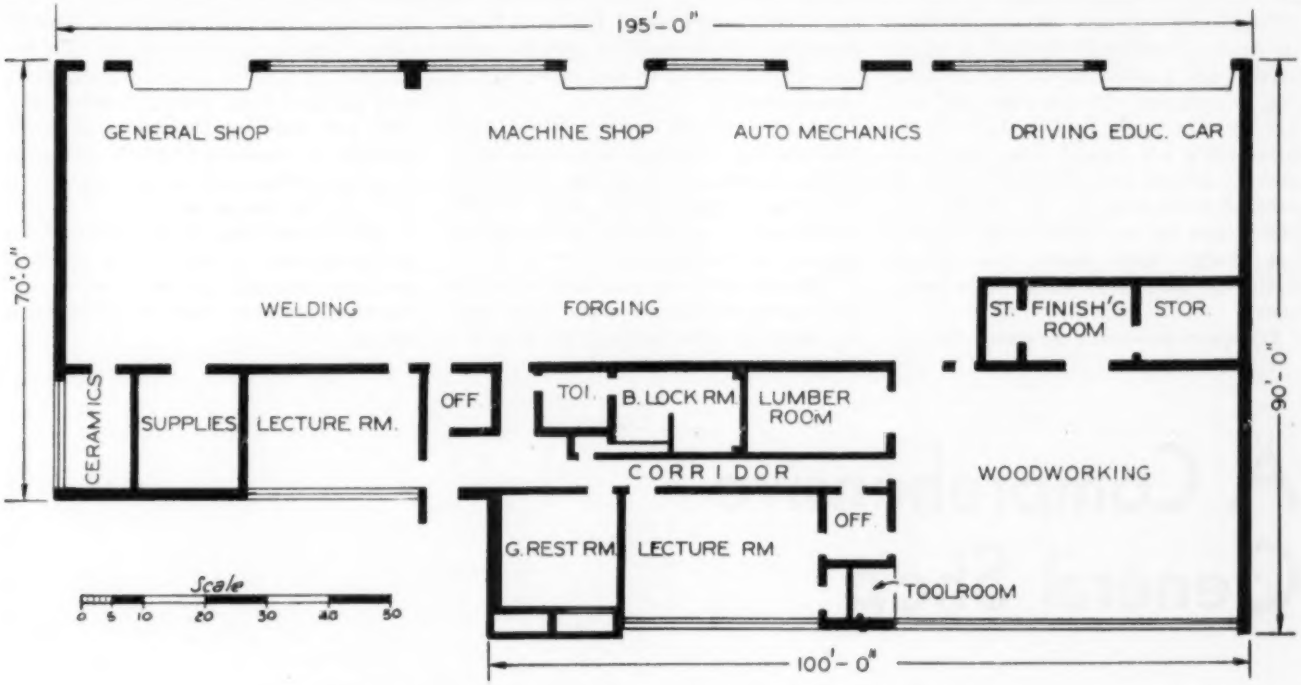
Industrial Arts and Vocational Agriculture Building, Liberal, Kans.

In order to meet the needs of both school and community, Liberal, Kans., has recently completed a new industrial-arts and vocational-agriculture building. Liberal is located on the vast wheat plains of Kansas and is surrounded by a large number of natural gas fields. Being a city of ten thousand, other industries include aircraft, leathercraft, and other smaller industrial firms. This building, which was built at a cost of $250,000, is utilized for the teaching of leathercraft, woodwork, mechanical drawing, ceramics, welding, forging, machine shop, art metal work, general farm shop, and vocational agriculture. These subjects are offered to age groups ranging from the seventh grade through adults. Adult classes have been offered in general farm shop, woodwork, art-metal work, and ceramics. There is also a program for war veterans of this area in the field of agriculture and general farm maintenance.

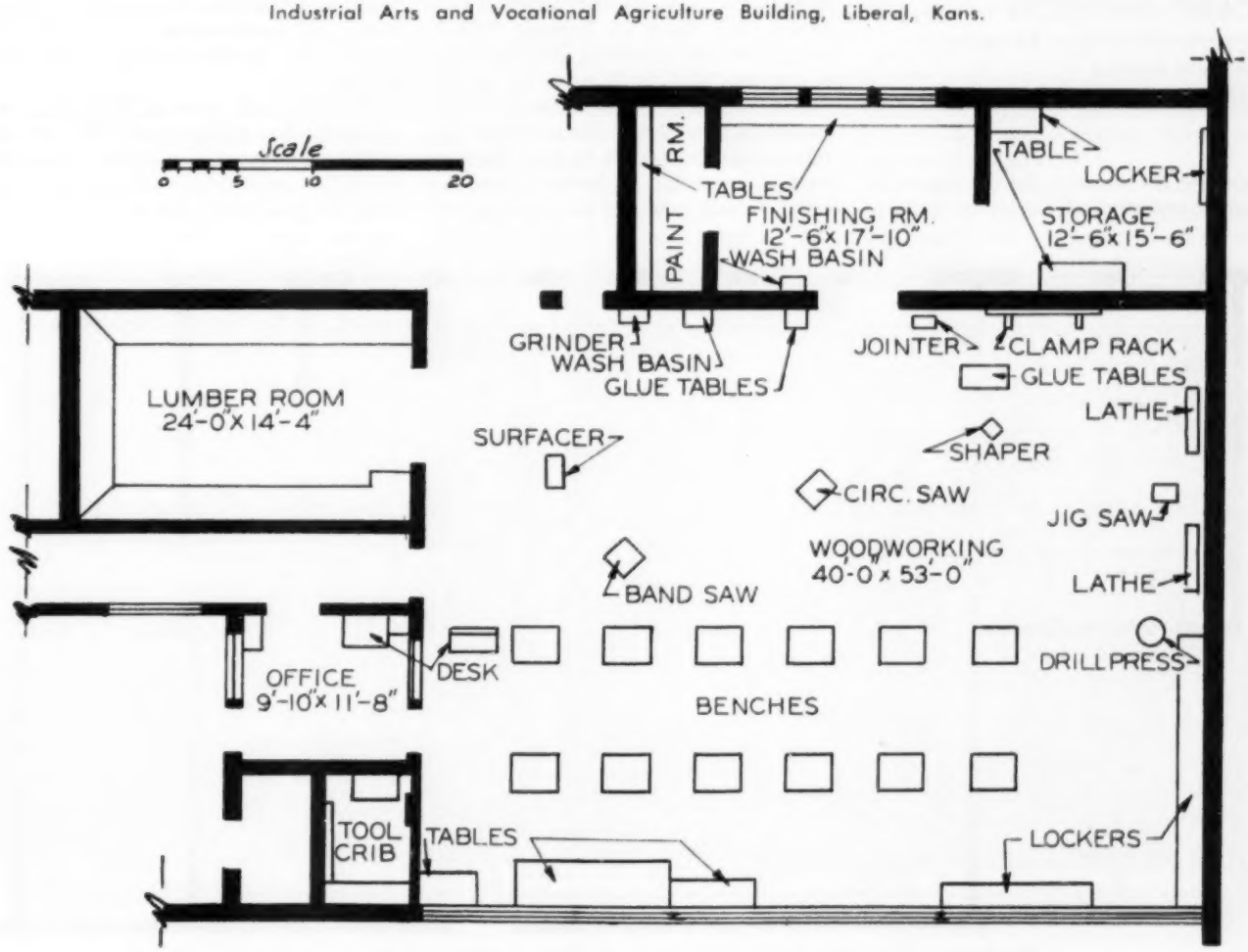
An average of 250 students use this building each day. There is no limit to the uses of the 16,500 sq. ft. area in this building as it is designed to handle any size project. It has two 20 by 20-ft. overhead doors which will permit the entering of large trucks, self-propelled combines, and other large farm implements. A large amount of space is provided for the construction of large hog and calf feeders as well as an innumerable number of smaller projects. In addition to the 20 by 20-ft. overhead doors, it is also equipped with two 12 by 12-ft. overhead doors which permit entrance to other parts of the building. Its spacious rooms include both boys and girls locker, shower, and rest rooms. Large closets and storage rooms are provided for all areas of instruction. Approximately 3000 square feet are utilized by woodworking students. A total of 24 students can take woodwork at one time.



Machine shop and woodwork areas, High School, Liberal, Kans.



Industrial Arts and Vocational Agriculture Building, Liberal, Kans.



Woodworking shop at the Industrial Arts and Vocational Agriculture Building, Liberal, Kans.

Completely equipped for woodworking, the many power tools include a 16-in. surfacer and a large shaper. The finishing room is equipped with spray gun and suction fan. The fan is used to draw off the gases which are formed from the many different finishes used. Bulletin boards are provided in all areas and give a place for added color to the building and instruction. Large wash basins are located throughout the shop as well as in the locker rooms.

Perforated acoustical tile covers the ceilings of both lecture rooms. Buff brick forms the exterior of the building with the addition of glass blocks to add more light in certain areas.

An extra special feature of the industrial-arts and vocational-agriculture building at Liberal, Kans., is the 2 by 20-ft. flower box located near the front entrance which provides extra color to the appearance of the building.

Industrial arts and vocational education are growing in Liberal Kans. Not every boy wants to enter business, the arts, or a profession upon the completion of his education. Training in industrial arts and vocational agriculture is now an important part of the Liberal public school system. This new building provides a place for students to receive a practical education, experience which can be used not only in industry, but also on the farms of Kansas. It gives youth living in the industrial age an opportunity to know about industrial products, industrial processes, and some of the social problems found in an industrial society.

A Comprehensive General Shop

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The Stout Institute
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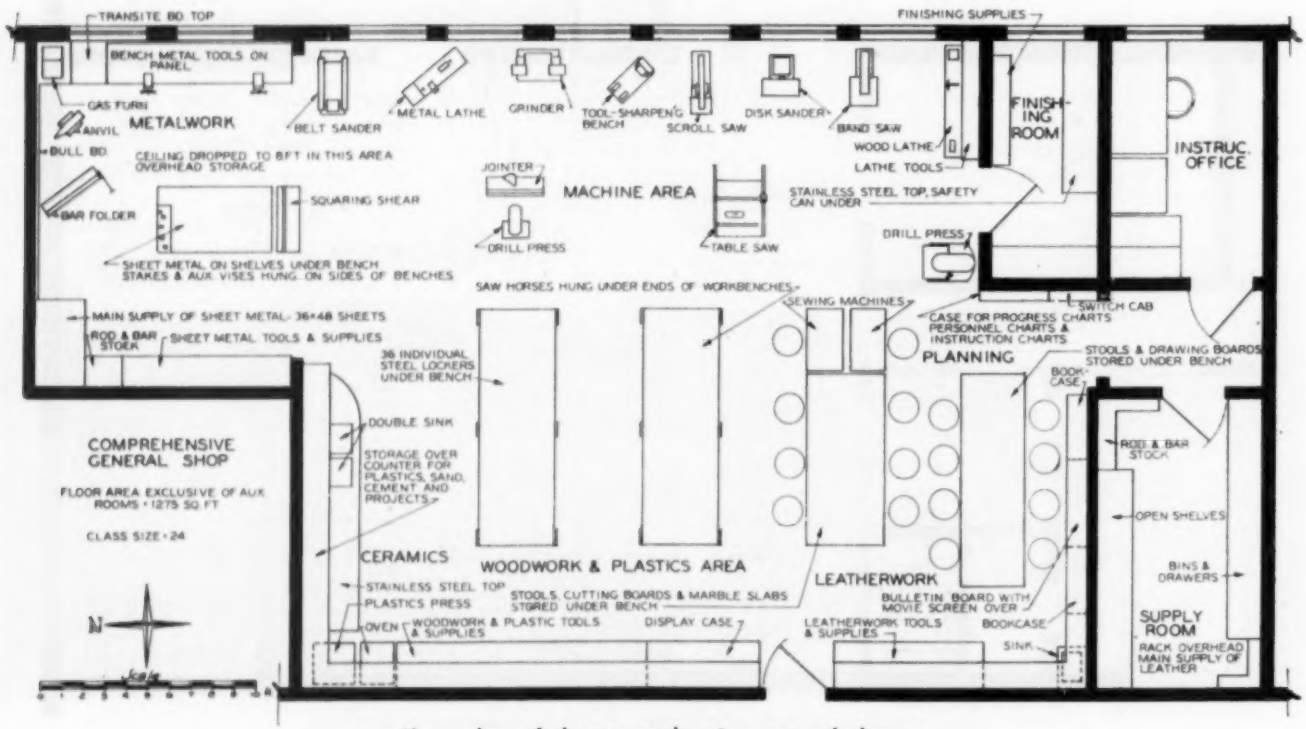
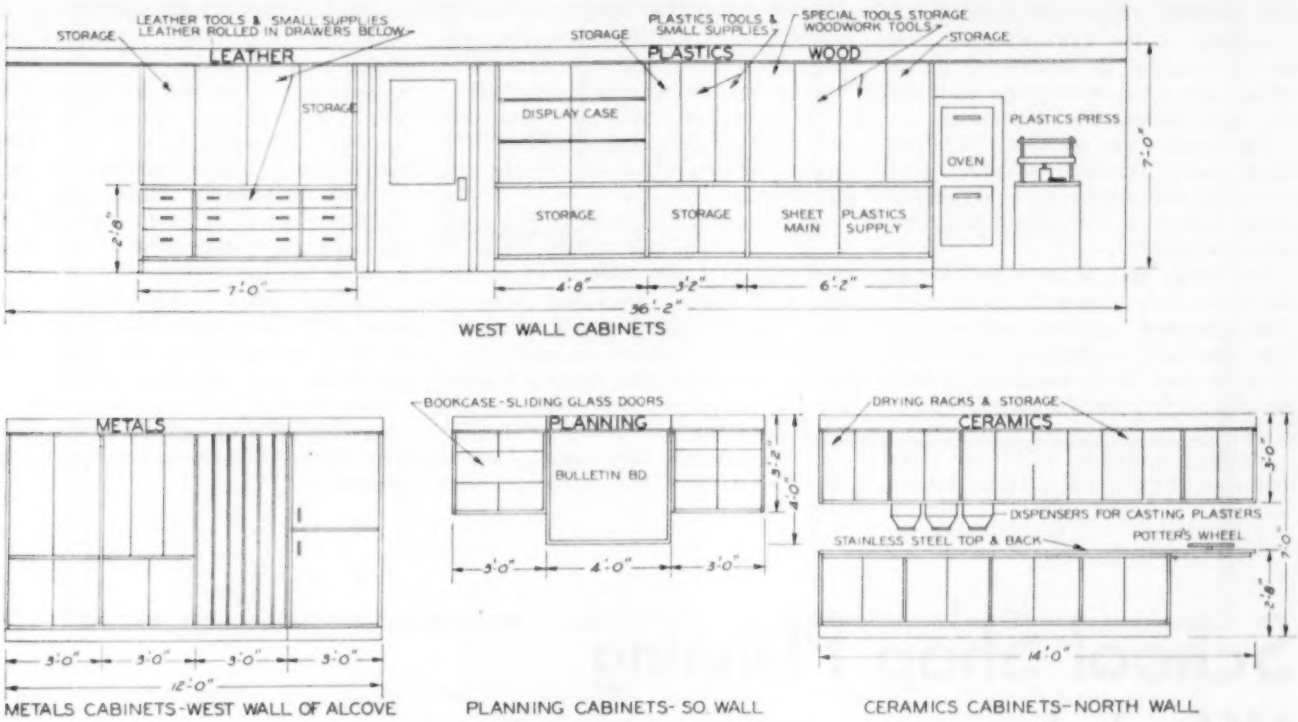
One of the shops of the division of industrial education at The Stout Institute, Menomonie, Wis., is the comprehensive general shop, Room 24, Bowman Hall. It is used for two somewhat different types of courses. First, it is used for teacher training courses for future secondary school general-shop teachers. These courses involve content areas in project planning, plastics, ceramics, leatherwork, and art metal. Second, it is used for a Menomonie High School general shop course for eleventh- and twelfth-grade boys and girls taught by student teachers from the college.

The shop was planned throughout to make each area relatively self-sufficient. All tools, supplies, and materials normally needed for work in each area are stored as close as possible to the individual work



Floor plan of the comprehensive general shop

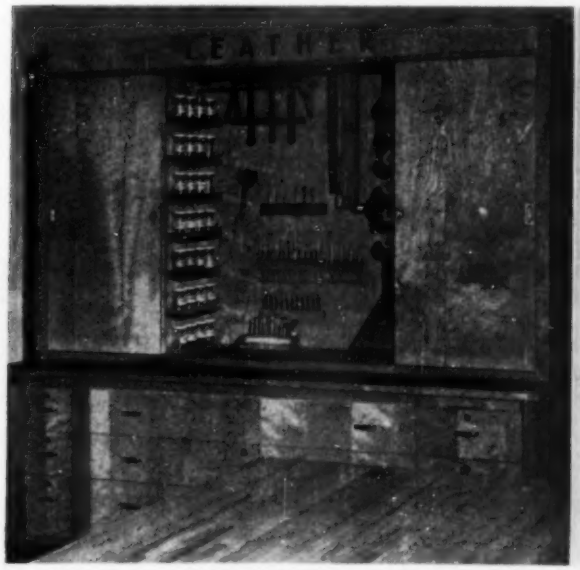


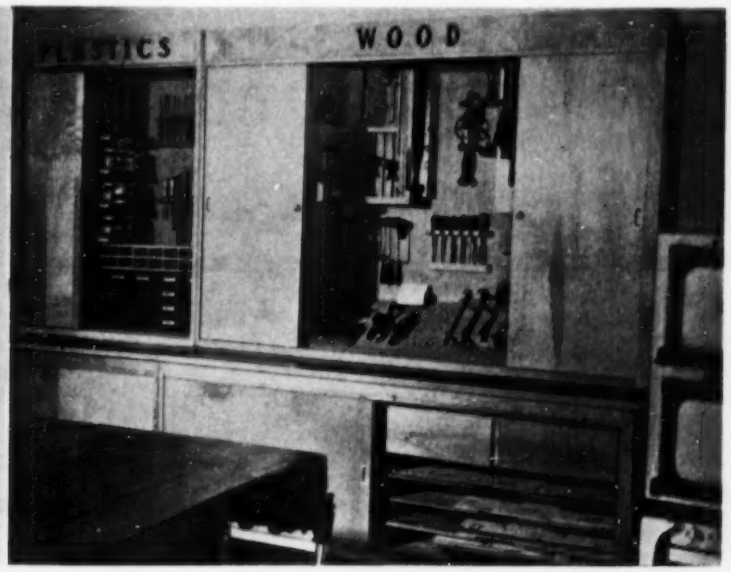
Comprehensive general shop

stations. This reduces cross traffic and makes it easier for the area foreman in the personnel organization to organize and control their areas.

For convenience in instruction, the various areas are oriented to provide multiple use of certain types of work stations. The plastics and woodwork areas are placed together. Two six-station workbenches are provided. It is possible in this way to offer bench woodwork to 12 students, or plastics to 12 students, or a combination of woodwork and plastics to a total of 12 students. In the high school course, all 12 stations are ordinarily used for woodwork; in the college course more of the stations are used for plastics.

Leatherwork and project planning require similar types of work stations. Flat bench space with stools serves equally well for drawing and planning or for leather-





At left — leatherwork tool and supply cabinet. All regularly used tools and supplies are located in the center section. The two end compartments, covered by the sliding doors, contain the main supply of small items such as snaps, buckles, rivets, etc. The wide drawers below contain large rolls of leather; the narrow drawers contain small pieces of leather sorted according to kind. At right — woodwork and plastics tool and supply cabinet. The center section of the woodwork cabinet contains all regularly used tools for the college class where relatively few students do woodwork. The two end compartments contain tools for the high school class. Sheet plastics are stored on the shelves in the lower compartment, while the small pieces are stored in the two drawers. The lower compartment to the left contains the main supply of sheet plastics. The oven to the right is for forming plastics.

work. For this reason the planning area is adjacent to the leatherwork area. At the beginning of the courses all of the stations are ordinarily used for planning; later more are used for leatherwork.

The ceramics area includes a metal top bench with a stainless steel cabinet sink. Five or six work stations are provided with storage facilities in the cabinets above and below the bench.

The metals area includes facilities for cold-metal work, simple hot-metal work, sheet-metal work, and some machine work. The sheet-metal workbench can be converted to four bench metalwork stations by fastening four portable machinist's vises in place.

Finishing is confined to a small closed room equipped with two metal top benches and drying racks. A small spray area is included. Since relatively few students are performing finishing operations at the same time, the four station area is sufficient.

Storage of main supplies is in a separate room that can be locked. Currently used supplies are restocked from it by the supply foreman.

All cabinets in the shop are of natural finished birch. The base cabinets are 26 in. deep and the upper cabinets 16 in. The tops of all cabinets are 7 feet above the floor. A vertical grain facing is carried around the top of all cabinets and bulletin boards. This serves to *tie* the shop together and provides a convenient place to spot the names of the various areas of instruction. The cabinets have sliding doors to conserve aisle space. Sliding doors are often inconvenient; the doors seem always to cover the parts of the cabinets where needed tools and supplies are located. This disadvantage is avoided by sliding the doors over space that is used for items not regularly needed by the class. This may include storage of main supplies, special tools, or tools for another class. The doors are locked in the open position at the beginning of the period so that they are never left *half open*.

The entire shop is rather small; it has about 1275 square feet of floor space. This allows an average of about 50 square feet per student. The shop is an excellent illustration of what can be done to offer a comprehensive shop program within relatively limited space in the one-shop school system.

School Shop Planning Workshop

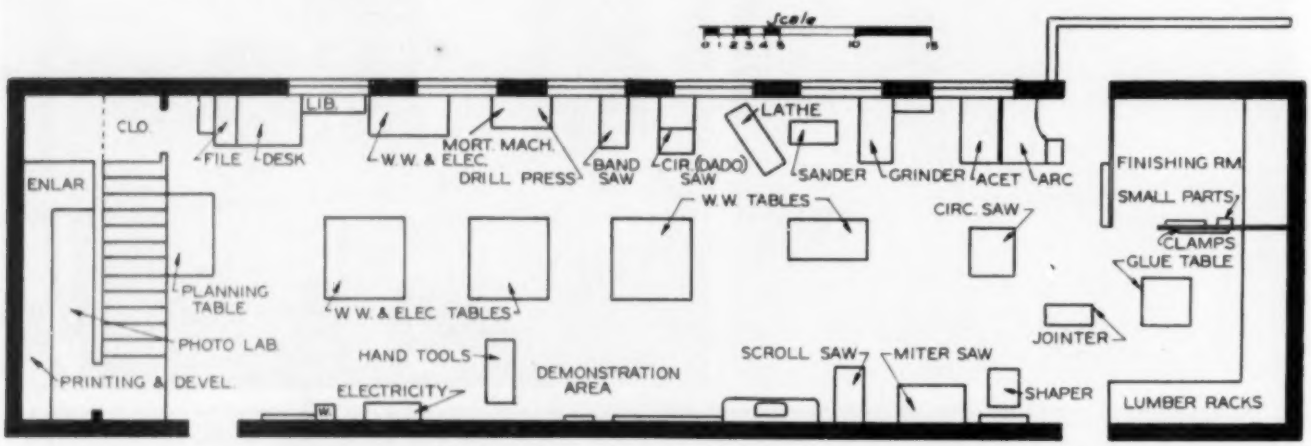
LOWELL L. CARVER
Professor of Industrial Education
Iowa State College
Ames, Iowa

During the first two weeks of summer school, June 15–26, a workshop dealing with *School Shop planning* was offered at Iowa State College. It carried three hours of credit.

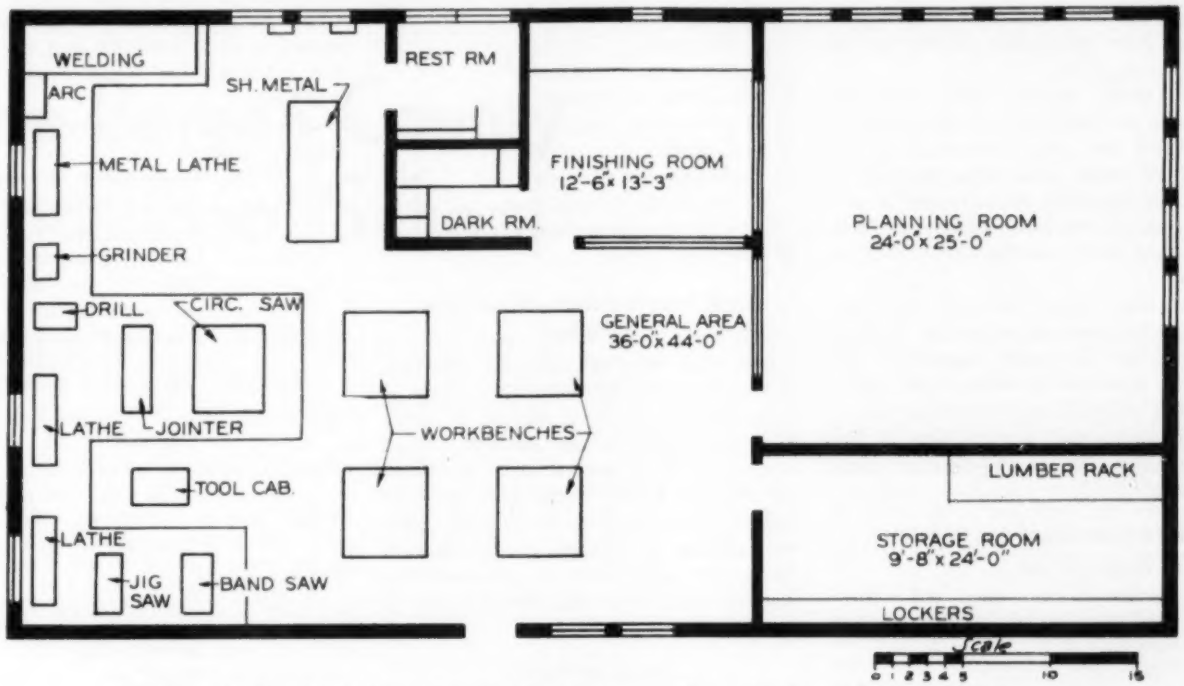
The workshop was designed primarily for those who had planning problems either for a new building or for the remodeling of an existing shop or building. It was intended that only experienced teachers and administrators with planning problems enroll, although others were accepted by securing permission from the instructor.

The workshop included the following general considerations and objectives.

1. A general overview of planning problems as they exist in the various schools and communities.
2. A consideration of the basic techniques and principles of planning as they are generally applied today.
3. Trips to existing shops and buildings.
4. Work on individual problems.
5. Discussions by well-qualified resource people.



Present high school shop, Roland, Iowa. Edwin Stone, teacher

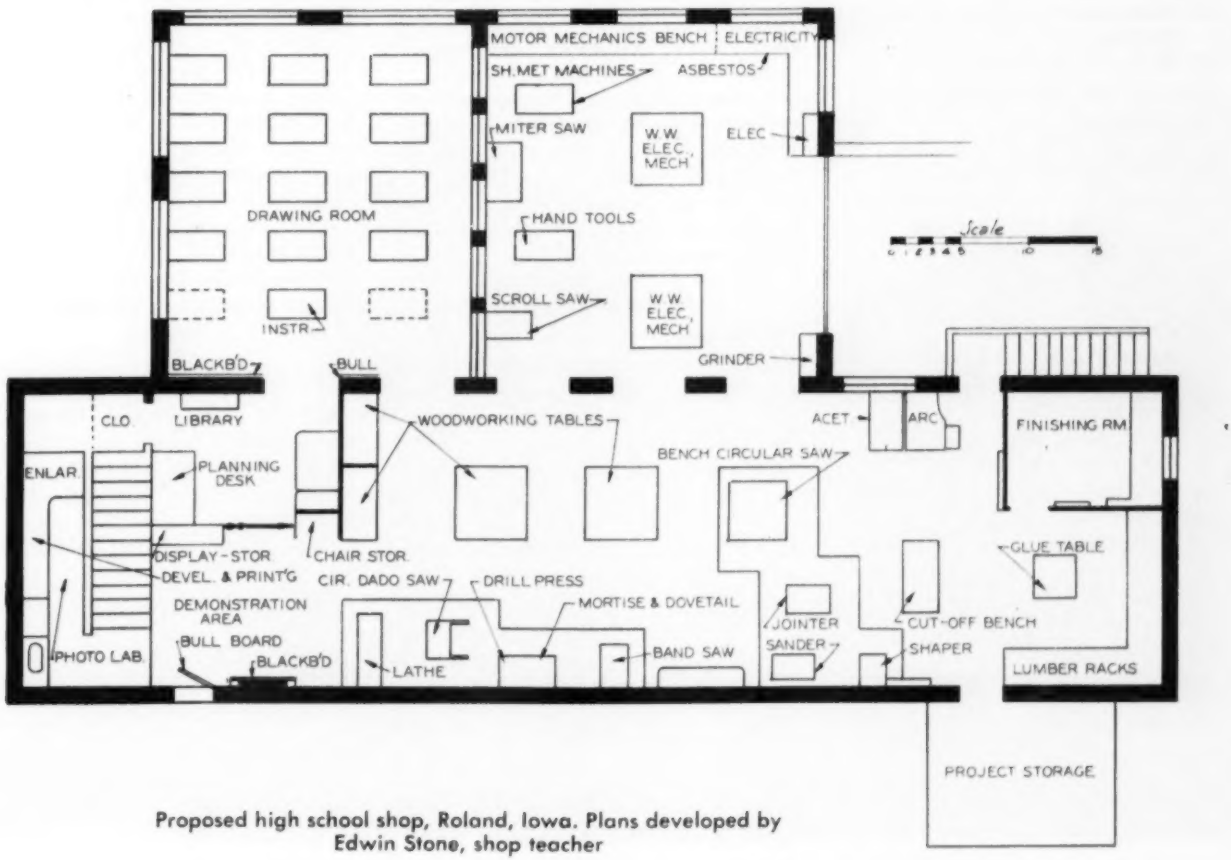


Proposed high school shop, Grundy Center, Iowa. Plans developed by Milton Behrens

General Overview of Planning

1. Since industrial-arts education came into the schools of our country, a little more than fifty years ago, there have been many changes. These changes have been taking place so rapidly that it has been difficult for even the best of our leaders to keep pace with the times.

2. The first shops were copied after



Proposed high school shop, Roland, Iowa. Plans developed by Edwin Stone, shop teacher

those of industry and were largely production shops rather than centers for the education of youth.

3. In many schools shops were first housed in old buildings and old rooms.

4. There has been a tendency to disregard the future in our shop planning.

5. Shop planning is becoming a task that is too big for many educators. There needs to be more specialists called into the picture.

6. In nearly every phase of shop planning much research is yet needed. Opinions and subjective judgment should more and more be replaced by science and facts.

7. The physical environment in which a student works does a great deal to help mold attitudes, ideals, and create a happy individual.

Basic Techniques and Principles

1. Basic considerations
   - *a*) Review of local, state, and national conditions which would influence planning
   - *b*) Community surveys
   - *c*) School surveys
   - *d*) Planning with the administration
   - *e*) Financing the program
   - *f*) Expansibility and flexibility
   - *g*) Safety factors as they influence planning
   - *h*) Maintenance as related to shop planning
   - *i*) Nature of equipment
2. Location, size, and shape of shops
3. Service features
   - *a*) Outside entrances
   - *b*) Power and light controls
   - *c*) Lighting — natural and artificial
   - *d*) Washing and toilet facilities
   - *e*) Drinking facilities
   - *f*) Exhaust systems
   - *g*) Ventilation
   - *h*) Heating
   - *i*) Bulletin boards
   - *j*) First aid facilities
   - *k*) Fire extinguishers
   - *l*) Floor drains
4. Auxiliary rooms and facilities
   - *a*) Planning room
   - *b*) Lumber room
   - *c*) Demonstration area
   - *d*) Gluing and assembly area
   - *e*) Finishing room
   - *f*) Student lockers
   - *g*) Storage facilities
   - *h*) Washing and toilet facilities
   - *i*) Office space
5. Architectural details
   - *a*) Flooring
   - *b*) Walls
   - *c*) Interior painting
   - *d*) Ceilings
   - *e*) Partitions
   - *f*) Windows
   - *g*) Acoustical treatment
6. Remodeling the existing shop
   - *a*) Additional space
   - *b*) Lighting
   - *c*) Repainting
   - *d*) Replacing old equipment
   - *e*) New service facilities
7. The Shop Layout

Field Trips to Existing Shops and Buildings

Two days were set aside for this part of the workshop. An attempt was made to plan the trips so as to include as many different situations as possible. Small schools, medium sized schools, and large schools were visited. Some shops were excellent, some fair and others poor, some well planned and others poorly planned. From the expressions of the workshop members this was a very valuable part of the program.

Resource People

In a workshop of this type it is impossible for any one person to know all the angles. It was felt that certain individuals because of their experience and training could add much to the workshop.

Two industrial-education directors who had just lived through a building program appeared before the group. They were able to add much of a practical nature.

A representative of a large paint manufacturing concern appeared before the group and discussed color and its application to shop planning.

It was also possible to have a representative of a tool and machine company present for a presentation.

Individual Problems

Each member came to the workshop with a problem. Considerable time was spent by each member working on solutions to his individual problem. Some of the type of problems which were worked on are listed below.

1. General shop for county seat town (new building)
2. Remodeling shop in town of 1000 to include more space and more activities
3. Building of an addition to accommodate a shop for a small consolidated school
4. Reorganizing of woodshop for a high school of 350
5. Remodeling an industrial plant to accommodate a technical school
6. Laying out a shop for a laboratory school

Two examples of plans developed in the workshop are shown on page 81.

Time Schedule: A time schedule was developed so as to make the best use of the time available. The schedule was set up as follows:

Monday, June 15 — Registration

Tuesday, June 16 —

9:00 a.m.	Organization of workshop
10:00 a.m.	General overview of planning problems
12:00 noon	Lunch (arrangements were made for the group to eat together each day)
2:00 p.m.	Basic techniques and principles of planning (class continued to 5:00 p.m.)

Wednesday, June 17 — (Same Plan as Tuesday)

Thursday, June 18 — Field trip (8:00 a.m.–5:00 p.m.)

Friday, June 19 — Field trip (8:00 a.m.–5:00 p.m.)

Monday, June 22 —

9:00 a.m.	Convene as a group to receive instructions for the week's work
10:00 a.m.	Begin work on individual problems (a drawing room was available for this phase of the work)
12:00 noon	Lunch
2:00 p.m.	Continue work as individual problems

Tuesday, June 23 —

9:00 a.m.	Convene to hear resource person, answer questions, and discuss problems
10:30 a.m.	Work on individual problems
12:00 noon	Lunch
2:00 p.m.	Work on individual problems

Wednesday, June 24; Thursday, June 25; and Friday, June 26 — Same schedule was followed as set up for Tuesday.

♦ World production of natural rubber amounted to 140,000 long tons in November, 1953, according to estimates of the Secretariat of the International Rubber Study Group. Output in the first 11 months of 1953 was placed at 1,550,000 long tons.

World consumption of natural rubber was estimated at 127,500 tons for November, 1953, 1,435,000 tons for the first 11 months of 1953 and 1,322,500 tons for the first 11 months of 1952. Estimated imports of natural rubber into Russia and China included in these figures amounted to 4250 tons, 94,000 tons, and 133,000 tons, respectively. — *U. S. Department of Commerce.*

The Bergen County Vocationol School*

JOSEPH C. FITTS
Vice-President, Board of Vocational Education
County of Bergen, N. J.

The Bergen County Vocational and Technical High School has finished its first year of operation in a new building constructed for the purpose in Hackensack, N. J. The building shown in plan and picture is the first unit of a larger building. Twenty-one acres are available in the plot for the completed building when all units are erected, and furnished, and space is provided as well for recreation and athletics.

The present unit has a capacity of 700 pupils which will be reached in the third year of enrollment. The first year enrollment was approximately 300. The second year enrollment has already passed 500.

The school operates four grades, from ninth to twelfth inclusive. The ninth year is devoted to exploratory courses in which the pupil is given short tryout periods in various shops so that he will be enabled to choose a major occupational course for which he has shown aptitude and inclination. The other three grades, tenth to twelfth, operate on a three-year vocational program which gives the students shopwork and related instruction and which will prepare the pupils to enter industry upon being graduated from the school.

The capital outlay for the school has been met by the Board of Chosen Freeholders as a county expense. The operating expense is met by a tuition fee which is paid for the pupil by the sending district.

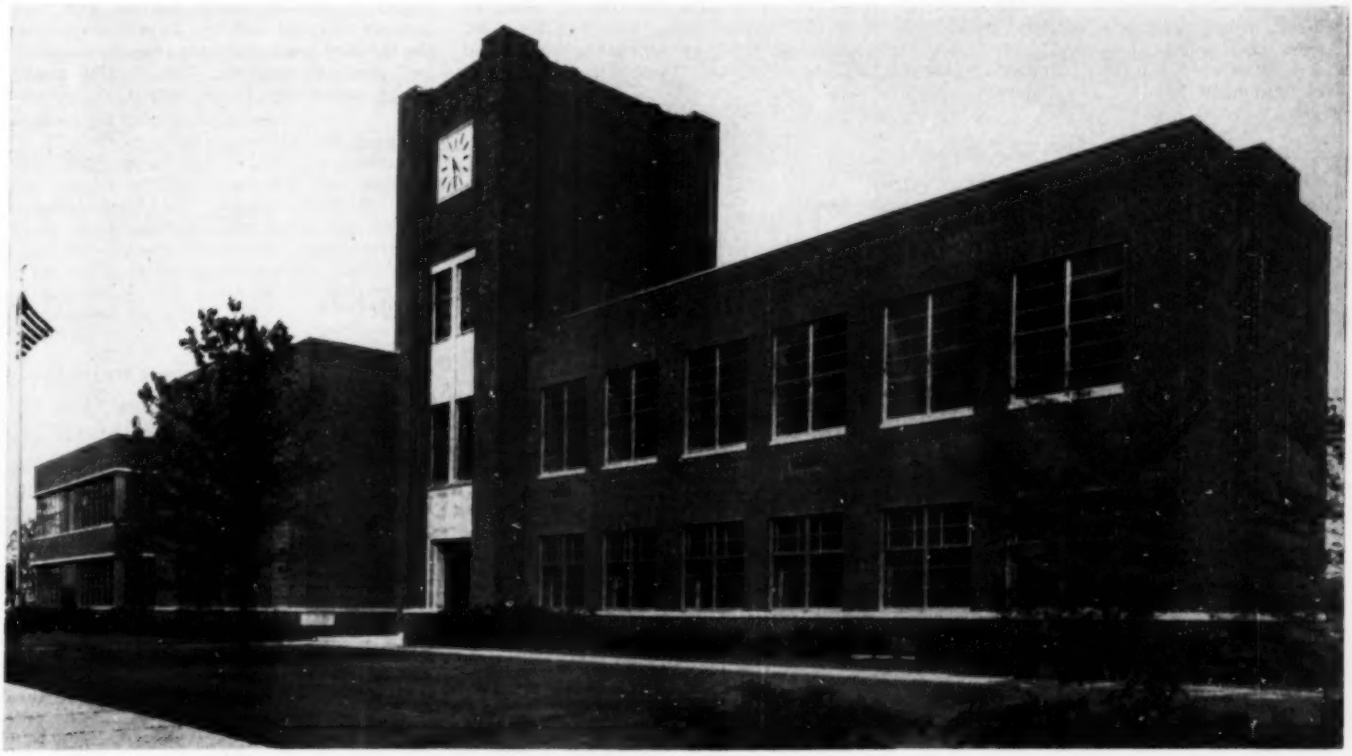
Following the established pattern of vocational education, special effort has been expended in fitting the courses to the needs of the county's industries. Bergen County (N. J.) is a rapidly expanding suburban area with several urban centers within easy commuting distance — New York, Newark, Passaic, and Paterson. In addition to the industrial plants in these cities the county itself is becoming heavily industrialized and has within its borders a wide variety of plants — metal-working, chemical, food, textile, and automotive assembly.

Because of its expansion as a residential area with the consequent importance of construction of homes and all the accompanying services, courses in the building trades have been given much attention and classes are operating in carpentry, masonry, bricklaying, plumbing, sheet-metal work, and electric wiring. In addition to the day school classes in the building trades, courses in apprentice training in the same trades are given.

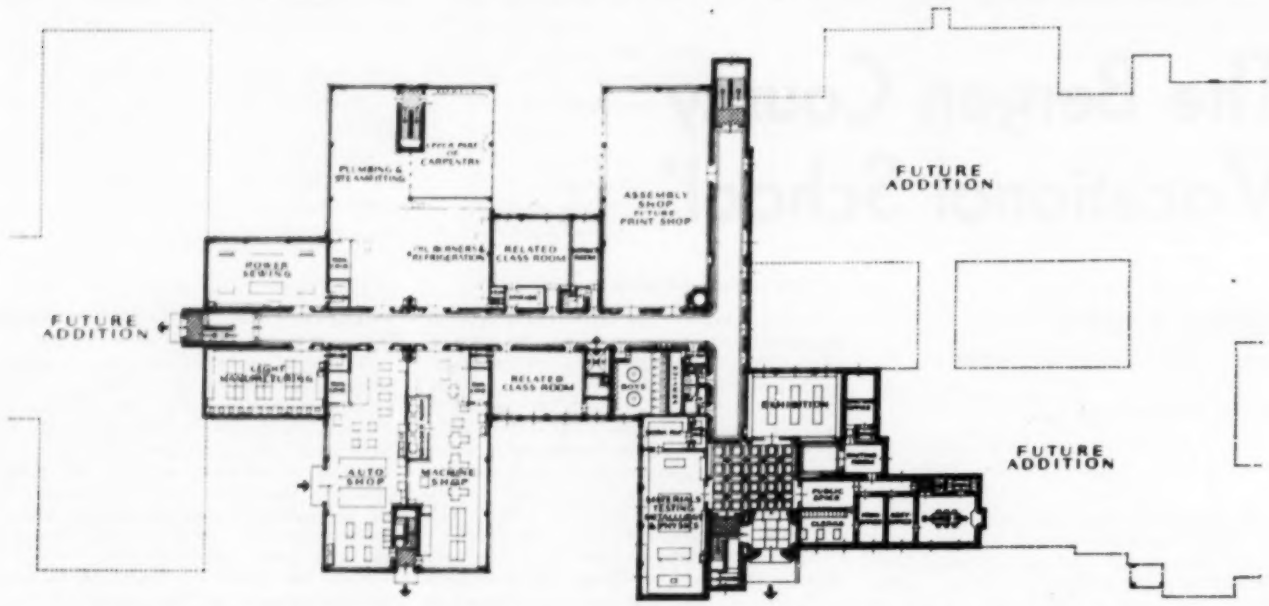
Since the school was built for vocational school courses it has been possible to design the shops and place them so that they are particularly well fitted for their purpose. For instance, the two-story carpenter shop and the masonry and bricklaying shop are in the basement adjacent to a drive-in truck delivery station. The two-story shop, for instance, gives ample opportunity for real house framing problems.

Since every suburban area has plenty of demand for service trades and food handling of various kinds, special attention has been given to this type of occupation in the school. Auto mechanics and automobile bodywork require

*Reprinted from the January, 1954 *School Board Journal*.



Front View, Bergen County Vocational School, Hackensack, N. J. -- Lawrence C. Licht, Architect, Engelwood, N. J.



First Unit of First Floor Plan, Bergen County Vocational School, Hackensack, N. J. — Lawrence C. Licht, Architect, Englewood, N. J.

a large force of workmen and the school desires to contribute to the training of mechanics for this work. During the present year there are five classes operating in this section of the school.

The bakers of the county requested that a school for bakers should be established. Equipment for a modern bakery was obtained and this fall a class in baking was started.

Restaurant cooking and serving has also been started in connection with the cafeteria which will in another year serve about 700 noon meals a day.

A suburban community also needs printing establishments both for its community papers and its job printing. A print shop has been equipped with linotype, job presses, automatic press, paper cutter, folder and perforator. This well-equipped shop has two classes using it this fall and is now turning out school printing. The coming year will see the shop producing a school paper which will bring the English work into close co-ordination with the graphic-arts courses.

The county, of course, must meet its demand for the beautification of the ladies, so a modern beauty parlor has been equipped and courses are given fitting the students to pass the state examination for work in this field.

To serve the television and radio field an electronic shop and laboratory trains boys in this field.

The courses described thus far have been primarily designed to serve the community. The needs of industry have not been neglected.

Two machine shops, one with heavy equipment and one with bench equipment, have been provided.

An industrial chemical laboratory provides means of training pupils for our ever increasing chemical industry. It is realized that the industry needs college graduates, chemists and chemical engineers, but it also needs junior technicians for a variety of routine

First Unit of Second Floor Plan, Bergen County Vocational School, Hackensack ,N. J. — Lawrence C. Licht, Architect, Engelwood, N. J.

laboratory work and such juniors can be trained in our laboratory.

A unique feature of the school is the boiler room which has been equipped as a steam laboratory. Five boilers have been installed — a hand-fired coal boiler, a stoker-fired coal boiler, two oil-fired boilers, and one gas-fired boiler.

The boilers have been so connected that they can be operated in combination or alone. Three headers are used — a high-pressure header, a medium-pressure header, and a low-pressure header. Various types of pumps have been provided so that the students can become acquainted with their construction and operation — rotary pumps and reciprocating pumps, high vacuum pumps, and feed water pumps — throughout the range of boiler room practice.

A large panel board has been provided with recording meters and indicators so that classes can study the result of different kinds of operation. The piping has been carefully marked so that the pupils can trace the different lines and see how the piping has been installed.

The heating system was also designed for instructional use and includes radiant panel heating, unit heaters, convectors, and free standing radiation. The boiler room supplies hot water for use throughout the building and steam for the cafeteria kitchen and serving operations. These uses give the pupils an opportunity to study distribution and use of heat as well as its production in the boiler room.

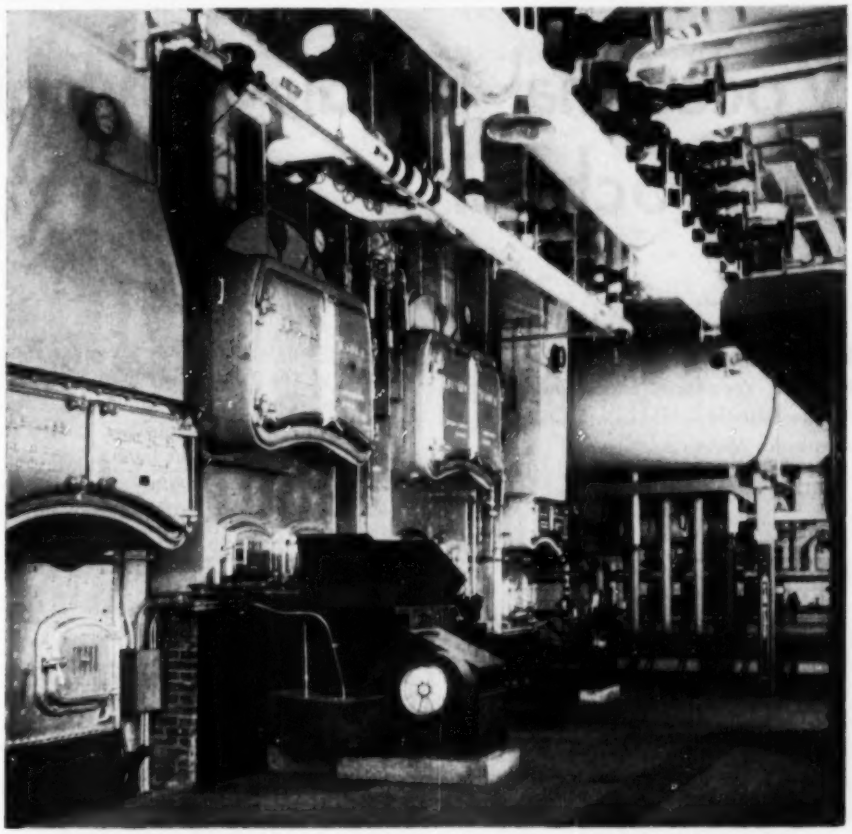
A classroom is provided on the mezzanine of the boiler room so that the engineer who may be instructing is never far from his duties of operating the plant.

This special equipment in the boiler room will permit instruction of pipe fitters, stationery engineers, and building custodians in the care and operation of a boiler room.

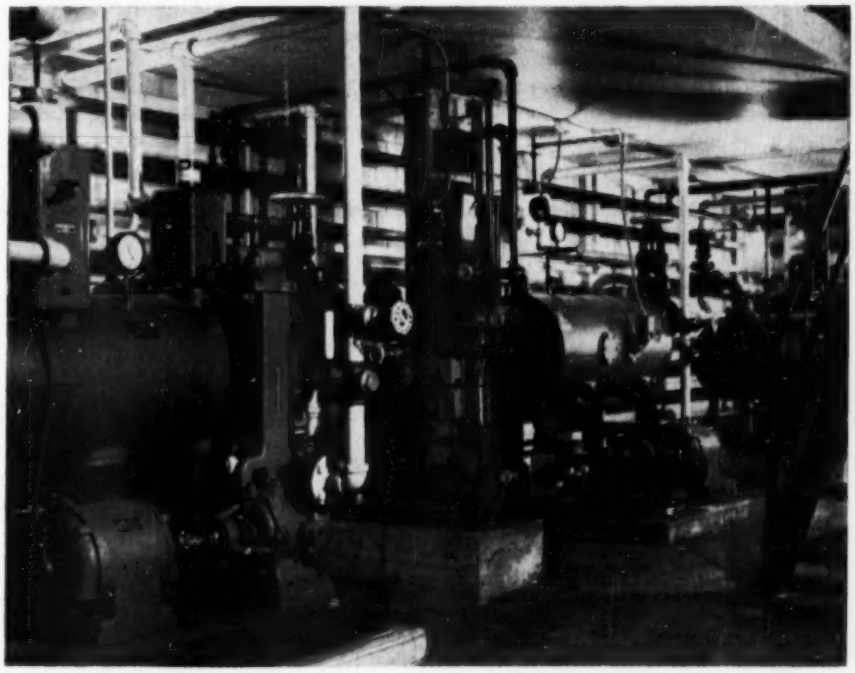
That there is need for instruction of custodians was demonstrated during the past year when at the request of local school districts the vocational school instituted and operated a course for school custodians.

The school is new and the operation has not been long enough to allow for assessment of results through placement and industry reports, but from observation of the past year, all concerned — the board, the faculty, and the advisory committees — are convinced that we have developed a most useful institution which will serve Bergen County well throughout the years.

Influenza vaccine has been found to have 10 to 32 times more potency when mineral oil instead of water is used as a base. Mineral oil, which is made from petroleum, also has been used successfully as a base for a polio vaccine. Experiments at the University of Pittsburgh School of Medicine indicate the new influenza vaccine with mineral oil may double the period of immunity and protect the human body against all known types of flu virus. Oil promotes progress in medical fields as well as in fields of science, industry, and business. — *Petroleum Newsnotes.*



The boiler room, which is used as a laboratory, contains five boilers which may be operated separately or in combination: a hand-fired coal boiler, a stoker-fired coal boiler, two oil-fired boilers, and one gas-fired boiler



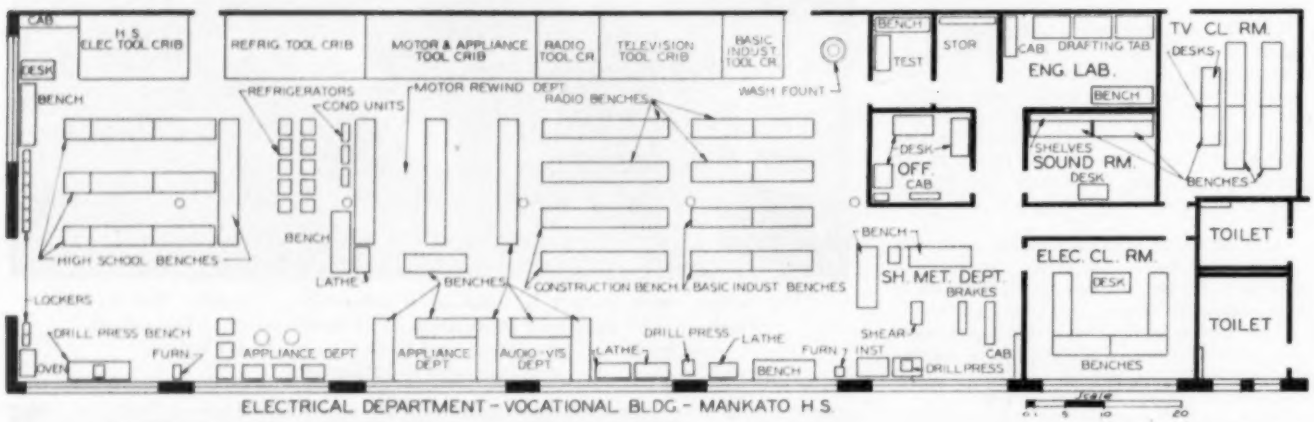
Rotary, reciprocating, high vacuum, and feed water pumps provide students with an opportunity to study the construction and operation of pumps

Vocational Building—Mankato High School

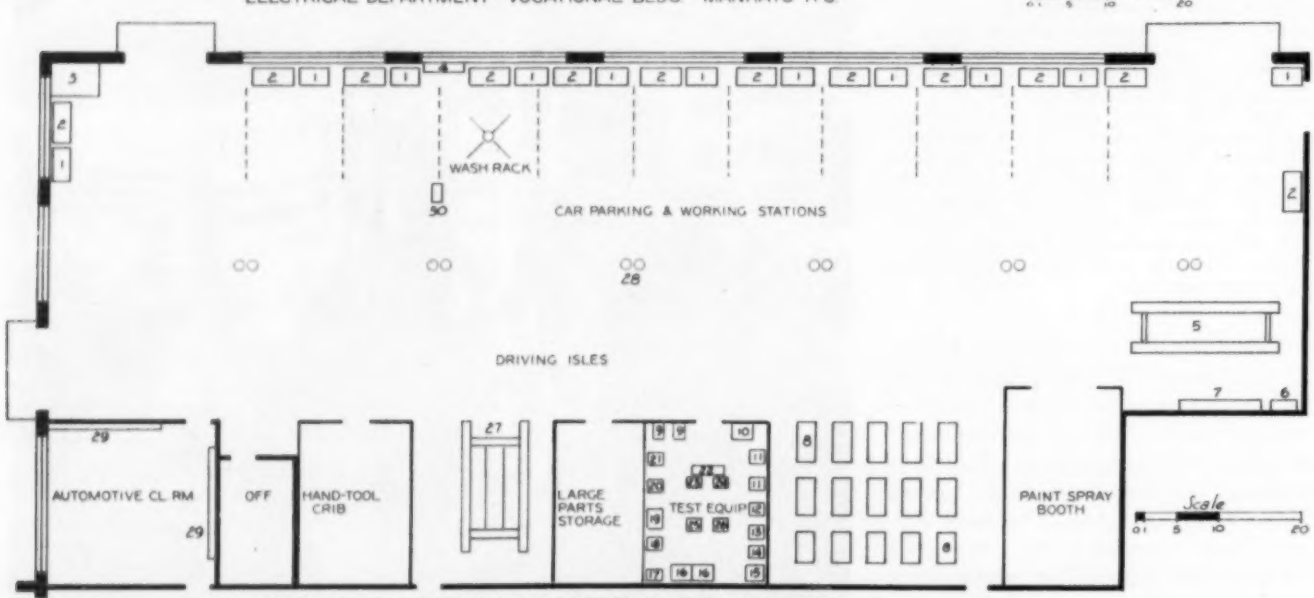
F. G. KALIN
Director, Vocational Education
Public Schools
Mankato, Minn.

The layouts which follow present a good picture of the vocational building of the Mankato High School, Mankato, Minn. They include the architects' first floor plan, the electrical department layout, the automotive department layout, the machine shop layout, and the farm shop layout.

The architects' first floor plan shows that the school was constructed with a minimum of load bearing partitions to provide for the utmost in flexibility. The design of the school also provides for second story expansion whenever justified by local and area training needs.

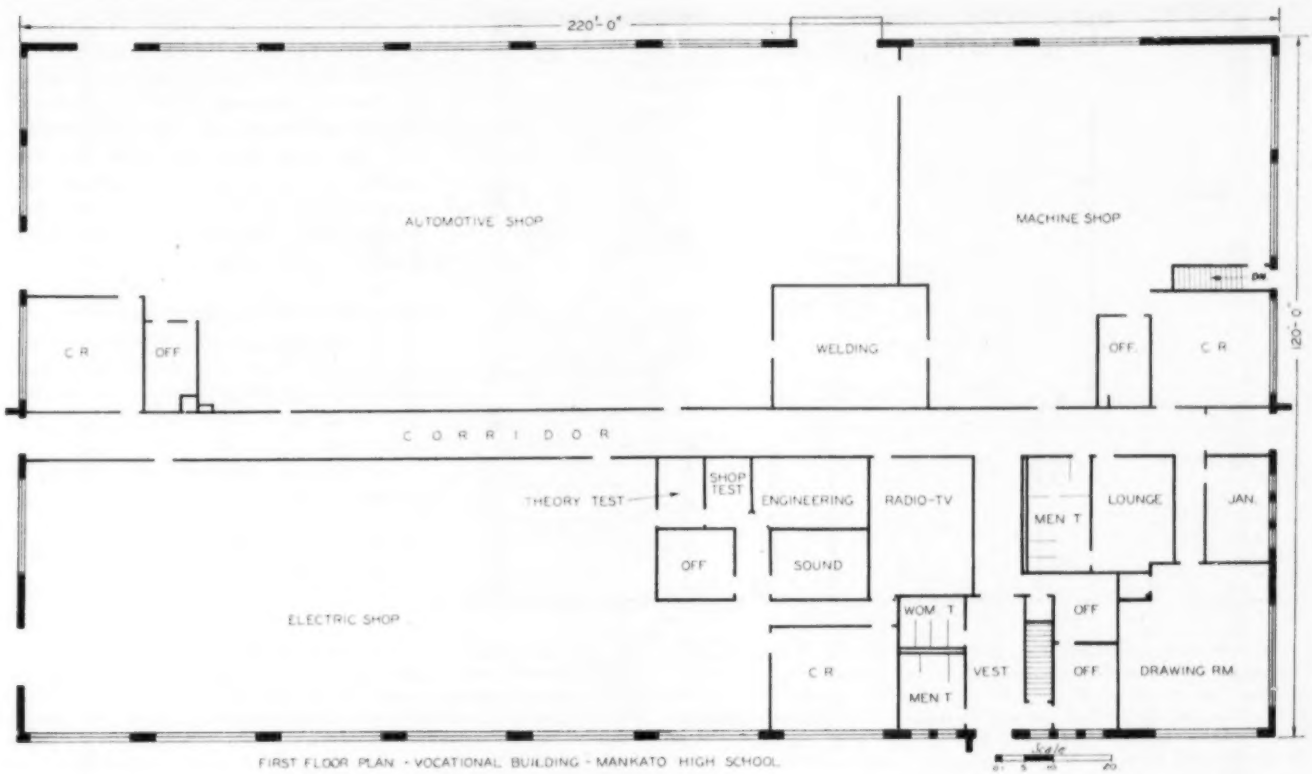


ELECTRICAL DEPARTMENT - VOCATIONAL BLDG. - MANKATO H.S.



AUTOMOTIVE DEPARTMENT - VOCATIONAL BLDG. - MANKATO H.S.

1. Parts storage box; 2. bench; 3. battery crib and slow charger; 4. washing sink; 5. alignment rack; 6. teleligner; 7. Bear alignment cabinet; 8. auto engines; 9. fast chargers; 10. motor analyzer; 11. distributor scope; 12. grinding wheel; 13. spark plug cleaner; 14. rivet machine; 15. brake lining lathe; 16. valve machine; 17. storage cabinet; 18. valve machine; 19. armature lathe; 20. distributor scope; 21. motor analyzer; 22. 75-ton press; 23. vise; 24. bench drill; 25. connecting rod aligner; 26. piston pin hone; 27. lubrication lift; 28. exhaust outlets; 29. parts cabinet; 30. parts washer

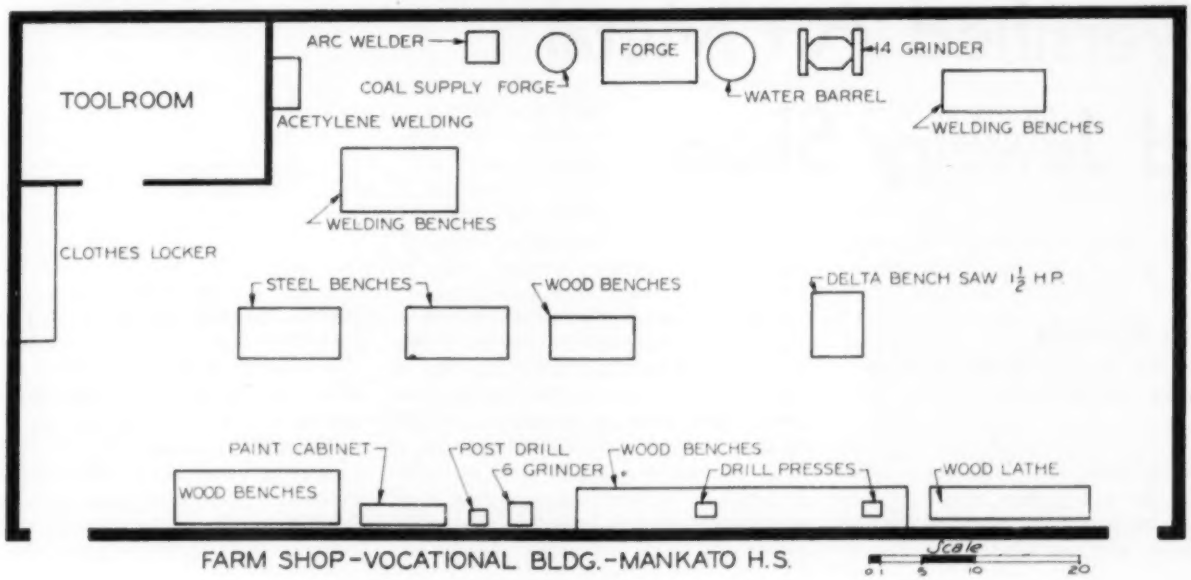


FIRST FLOOR PLAN - VOCATIONAL BUILDING - MANKATO HIGH SCHOOL

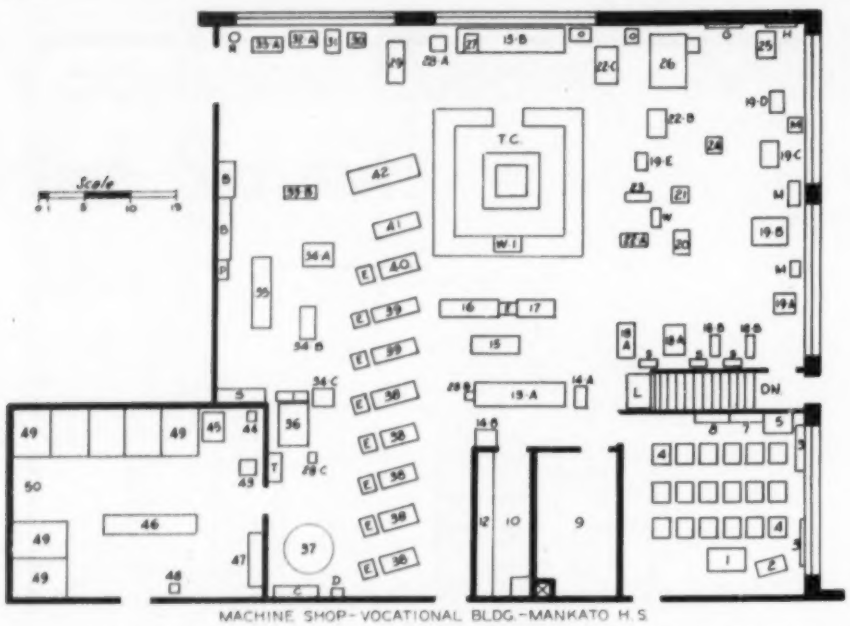
The electrical department plan shows that this department utilizes the services of five full-time instructors, each a specialist in a phase of electrical work. Each instructor has his individual tool and supply crib and shop space directly in front of his crib. The amount of shop space may vary from year to year as it is adjusted to student needs and training demands. Minimum of load bearing partitions within this shop make possible expedient space adjustments.

The automotive department employs two full-time instructors who work simultaneously in this department — one instructing high school students and the other post high school students. Plans for implementing an auto body course in this shop in the near future are now nearing completion. This will be done on a swing shift basis similar to the one used in the machine shop, whereby one class of students is completing their day at 3:20 p.m., while the swing shift receives related training in the classroom commencing at 2:30 p.m., and concludes shopwork at 9:00 p.m.

The machine-shop plan, with the exception of the tool crib, *T.C.*, is practically self-explanatory. The tool crib, however, we believe is somewhat unique for school shops, although it is utilized in industry. The total height of the crib is 8 feet, with the lower 4 feet consisting of cabinetwork and the upper 4 feet of ornamental cyclone fence. The cabinet work houses two layers



FARM SHOP-VOCATIONAL BLDG.-MANKATO H.S.



MACHINE SHOP—VOCATIONAL BLDG.—MANKATO H.S.

1. Classroom desk; 2. demonstration lathe; 3. heating units; 4. student desks; 5. blueprint files; 6. student reference files; 7. machinist library; 8. blueprint reference files; 9. office; 10. precision toolroom; 11. precision tool cabinet; 12. precision tool bench; 13-A. general workbench; 13-B. precision workbench; 14-A. sensitive drill and vise; 14-B. sensitive drill press; 15. turret lathe; 16. 12-in. engine lathe; 17. screw machine; 18-A. 16-in. shapers; 18-B. bench shapers; 19-A. hand milling machine; 19-B. universal milling machine; 19-C. universal milling machine; 19-D. end milling machine; 19-E. hand milling machine; 20. end mill and vertical shaper; 21. tool and cutter grinder; 22-A. vertical drill press; 22-B. twin drill press; 22-C. radial drill press; 23. milling machine; 24. tool and cutter grinder; 25. cylindrical grinder; 26. surface grinder; 27. cut-off machine; 28-A. buffing wheels; 28-B. general grinder; 28-C. tool grinder; 29. band saw; 30. sander; 31. power saw; 32. project and pattern lathe; 33-A. small hack saw; 33-B. power hack saw; 34-A. automatic punch press; 34-B. small hand punch press; 34-C. large hand punch press; 35. planer; 36. master fuse box; 37. wash stand; 38. 12-in. engine lathes; 39. 13-in. engine lathes; 40. 10-in. engine lathe; 41. 9-in. engine lathe; 42. 18-in. engine lathe; 43. large gas heating unit; 44. small gas heating unit; 45. quenching tank; 46. workbench and four (4) gas welding stations; 47. welding equipment cabinet; 48. grinding wheel; 49. arc-welding booths; 50. welding area; L — layout table; S — shaper work tables; M — milling accessory cabinets; G — surface grinder accessory cabinet; C — project cabinet; D — drinking fountain; O — miscellaneous supplies cabinet; T.C. — tool crib; R — broom rack; B — scrap bins; P — planer work table; S — supply cabinet; I — instructors' tool cabinet; T — tool and cutter cabinet; E — lathe end table; W — accessory rack; W-1 — tool issue window

A — Clothes locker; B — wood benches; C — steel benches; D — welding benches; E — Delta bench saw 1½ h.p.; F — forge; G — arc welder; H — acetylene welding; L — 14-in. grinder; J — 6-in. grinder; K — wood lathe; M — coal supply (forge); N — water barrel; O — jointer; P — post drill; Q — paint cabinet; R — drill presses

of student lockers for storage of individual tools and projects. On the inside of the cabinet walls are hung issue tools, and in the center of the inner island is our oil and lubrication storage area. This crib provides our shop with maximum light and also enables the instructors to maintain constant surveillance of all areas of the shop because the fencing above the cabinetwork does not hinder vision.

The farm shop area is located in the basement of the vocational school. In addition to the shop area indicated in the drawing, an unenclosed area equally as large is available for work and instruction pertaining to large wheeled trucks and farm equipment.

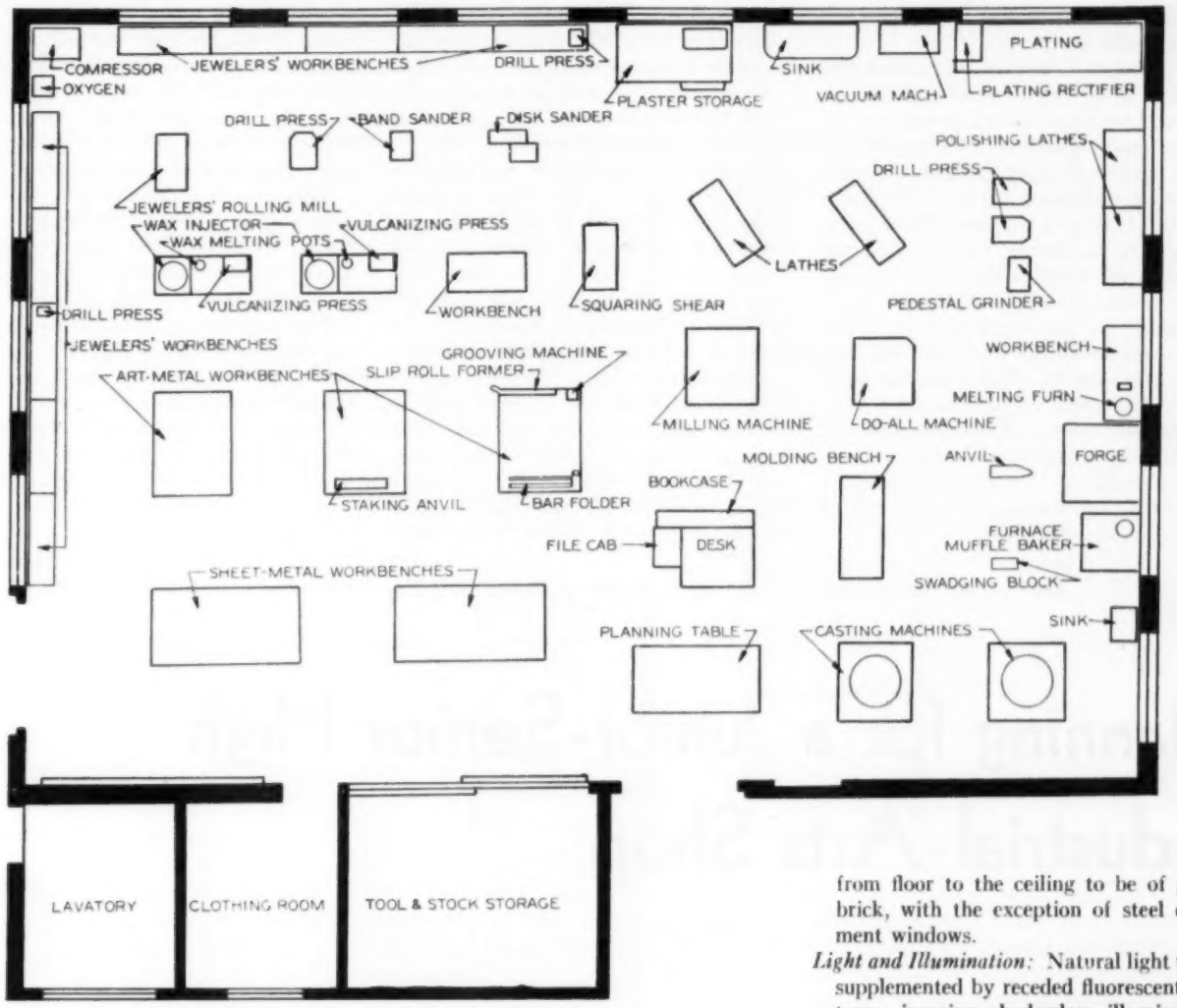
All the plans were originally drawn by students from the various departments and then were checked and reproduced by F. Roetzler and R. Moen, electrical and machine-shop instructors, respectively.

Diversified Art Metal and Jewelry Shop

DAVID PEYTON
Chelsea Vocational High School Annex
New York City, N. Y.

Now and then, a shop teacher is called upon to plan a new shop, or to carry out an extensive remodeling program. This responsibility was one which the writer accepted with much enthusiasm because it presented an opportunity to design a shop that would not only meet the needs of pupils in the slow learner classes, but would also retain its suitability for the training of those individuals preparing to enter the metalworking industry on higher levels. This shop was also to lend itself to the occupational extension classes designed for those individuals already employed who were seeking to advance in their respective vocations. Provisions were also to be made for the inclusion of adult education classes for those individuals seeking a leisure-time activity.

The problem, being a very practical one, necessitated much study and planning, and every facet was given deep consideration in order to bring about the most efficiently designed shop within the space allotted.



Diversified art metal and jewelry shop

References Were Obtained From the Following Sources:

1. Master Trade Analysis for Jewelry Making
   - *a*) List of basic machines
   - *b*) Equipment
   - *c*) Hand tools
   - *d*) Materials
   - *e*) Basic skills
   - *f*) Operations
2. Course of Study
   - *a*) Kind of training
   - *b*) Number of students
   - *c*) Amount of time allotted for shop instruction
3. A Study of Local Industries
   - *a*) Community activities
   - *b*) Industrial background
4. An up-to-date evaluation of existing facilities to include the latest advances in education and industry
5. The state, city, and board of education requirements

Shop Size: 40 ft. by 60 ft.
Number of Students: 18 to 24
Shape of Shop: Rectangular
Height of Ceiling: 12 ft.
Floor Area Per Student: 60 square feet per student is desired.
Location: Top floor level, preferred. A corner wing is preferred, facing north with windows on three sides.
Flooring: To be of good quality oak. Areas around primary machinery such as lathes, milling machines, entire forge area, casting machines to be poured non-skid concrete. The remainder of flooring to be gray and as near possible skid and acid proof. Finished flooring to be inlaid tile.
Ventilation and Heating: Adequate vents, flues, and exhaust fans shall be provided at the forge, furnaces, polishing lathes, and plating area. Building laws to be consulted for data concerning installation of same. Entire wall area 5 feet from floor to the ceiling to be of glass brick, with the exception of steel casement windows.
Light and Illumination: Natural light to be supplemented by receded fluorescent fixtures, insuring shadowless illumination equal to 52-ft. lumins at eye level.
Electrical Facilities: Light switches to be independent of power switches. Individual switches and fuses for each primary machine to be located in master control panel. Power safety switches controlling all equipment, to be spaced at intervals of 10 feet all around the shop for maximum efficiency in the event of any emergency. All wall and floor outlets to be installed as indicated on layout of service facilities.
Plumbing: Facilities for hot and cold water to be provided at both sinks in the shop, and sinks in the lavatory. Two water coolers to be installed. Water taps to be installed at plating area over tanks Numbers 2, 4, and 6, complete with overflow drains. Gas outlets of various sizes to fit bench furnace, pot furnace, ovens, forge, and bunsen burners at the waxing benches. Gas outlets will be provided at each work station of each of the jewelers' workbenches. Wherever facilities for gas outlets are indicated, appropriate

outlets will be provided for compressed air as well.

Color Scheme: Ceiling to be painted flat white. Upper wall area light pastel green. Lower wall area a deeper tone of pastel green. Location of the fire protection equipment to be indicated by red. First aid equipment will be bright green. A high visibility yellow will indicate stumbling or falling against hazards. Orange will warn of danger that might cut, crush, or injure. Blue will mark switch boxes and operating levers. The floor will be of gray inlaid tiles with the aisle markings in white indicating lanes of traffic. The color combinations indicated were taken from recommendations in Du Pont color conditioning.

Display Facilities: Green blackboard, 5 by 12 ft., to be mounted on south wall of shop facing the light. A 5 by 7-ft. plywood-backed, cork bulletin board, framed in birch, will be mounted on the outside sliding door of the tool room. A display cabinet, 8 ft. by 4 ft. by 4 ft., will be mounted in the hall on the outside wall of the tool room.

Much of the forethought and planning which has gone into this shop, is based primarily on the needs of the slow learner. Specialized training in salable skills for the payroll type jobs can be more effectively taught so long as individual differences are recognized. Equipment and materials must be available if successful learning is to take place. We must be ready and have available the projects and the facilities with which to complete those projects if the slow learner is to achieve successfully at his own level. It is well to bear in mind that the slow learner differs not in mind, but in degree. With regard to sensory and motor capacity, the slow learner is not far from normal. The slow learner usually responds well to the responsibility for the jobs he can do. Lastly, with respect to instinct and emotion the slow learner approaches much nearer the norms than he does in intellectual traits.

With these thoughts in mind, we realize there will be employed as helpers to the master tradesmen, the type of student trained in this comprehensive unit shop. With these machines and equipment they will have learned as many skills throughout the full range of the trade as their ability permits. In many applications the overlapping of skills was a strong determinant in the final selection of the machinery and equipment indicated. This then would provide us with ample facility to train for the trades and industries having common fundamental skills.

Planning for a Junior-Senior High Industrial-Arts Shop

RALPH O. GALLINGTON
Professor, Industrial Arts Education
The Pennsylvania State College
State College, Pa.

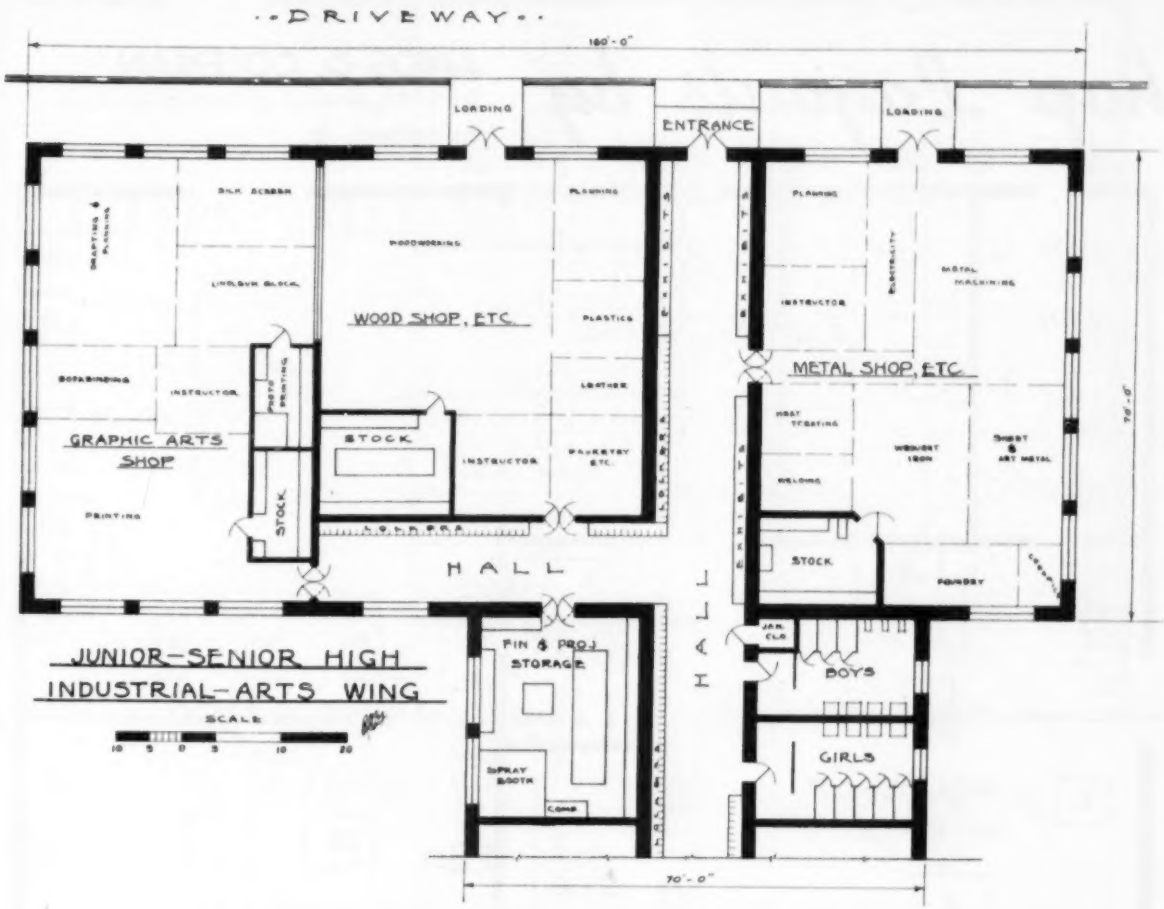
With the demand for more and better housing for general education has come the need for leadership in the field of planning. Administrators and architects planning new school buildings have shown little knowledge of the needs of various subject-matter areas where special facilities are required. Perhaps industrial-arts people are partially to blame even though our aims have been adequately defined. There is no doubt that these aims have been accepted as generally valid in meeting certain needs of youth, but implementation seems to have been neglected by those engaged in industrial-arts education. In so far as the physical plant is concerned, this is especially true. It seems logical that industrial-arts people should become more and more interested and actively engaged in the planning of industrial-arts shops and laboratories.

Basic Planning

The importance of planning cannot be underestimated. One should begin from the standpoint of aims. An understanding of the aims and philosophies of general education is basic and should form the foundation of industrial-arts aims. It is not the purpose of this article and the accompanying floor plan to develop and present these aims in a profound manner. Rather, this writing attempts to show how one might develop an industrial-arts department for a medium-sized junior-senior high school where the more basic aims and philosophies are being emphasized.

The accompanying plan is far from complete in so far as placement of equipment and service outlets are concerned; rather, the purpose is to show an organization of space for use in accomplishing the basic aims of industrial arts. The more basic aims deal with a *broad* coverage of *exploratory* experiences in industrial technology leading to *better understanding* and *appreciation* of *industry* and the *products of industry* as well as of *handmade articles* and *individual craftsmanship*. The less basic aims would deal with the *development of skills*, the pursuit of *special interests* and the like. The less basic aims are, for the most part, disregarded in this proposed layout.

The author has in mind a school being planned for a maximum population of around 750 junior and senior high school students. In all probability, there may be about three to five industrial-arts classes in each of the 7–12 grades inclusive. Also, it is assumed that each of the junior high school grades may be required to take industrial arts from two to five periods per week, and that the tenth, eleventh, and twelfth grades may be allowed to elect industrial arts, making up several additional special-interest industrial-arts classes. To plan for a larger school, one should recommend more space. It must be kept



in mind that this is a proposal rather than an actual situation already a reality.

The Emphasis

One often hears of general education and its responsibilities in meeting the needs of youth. The term *general* implies that there is a broad coverage. This presentation tends to emphasize this aim by suggesting a wide variety of industrial and handicraft experiences wherein the student is allowed to explore his interests, aptitudes, and capacity. It also suggests for him a wide variety of industrial experiences which tend to broaden his concept and appreciation of modern industrial technology. Except as the limited facilities are able to provide, the *development-of-special-interests* aim is somewhat limited by this plan. Actually, the whole industrial-arts wing is more specifically designed for exploratory junior high school level classes and does not provide adequately for the development of special interests among senior high school students. To offset this inadequacy somewhat, smaller senior high school classes might be assigned to each instructor in the proposed plan. In studying the accompanying floor plan of the industrial-arts wing, one must keep in mind that broad basic industrial arts is emphasized.

Some Features of the Plan

From an over-all point of view, the plan is designed so that a considerable amount of isolation keeps *shop noises* centralized and makes them less objectionable to other classes. This isolation also makes possible the better receiving of supplies and the centralization of departmental activities. The common finishing room and the exhibits of departmental work help to coordinate and integrate departmental activities.

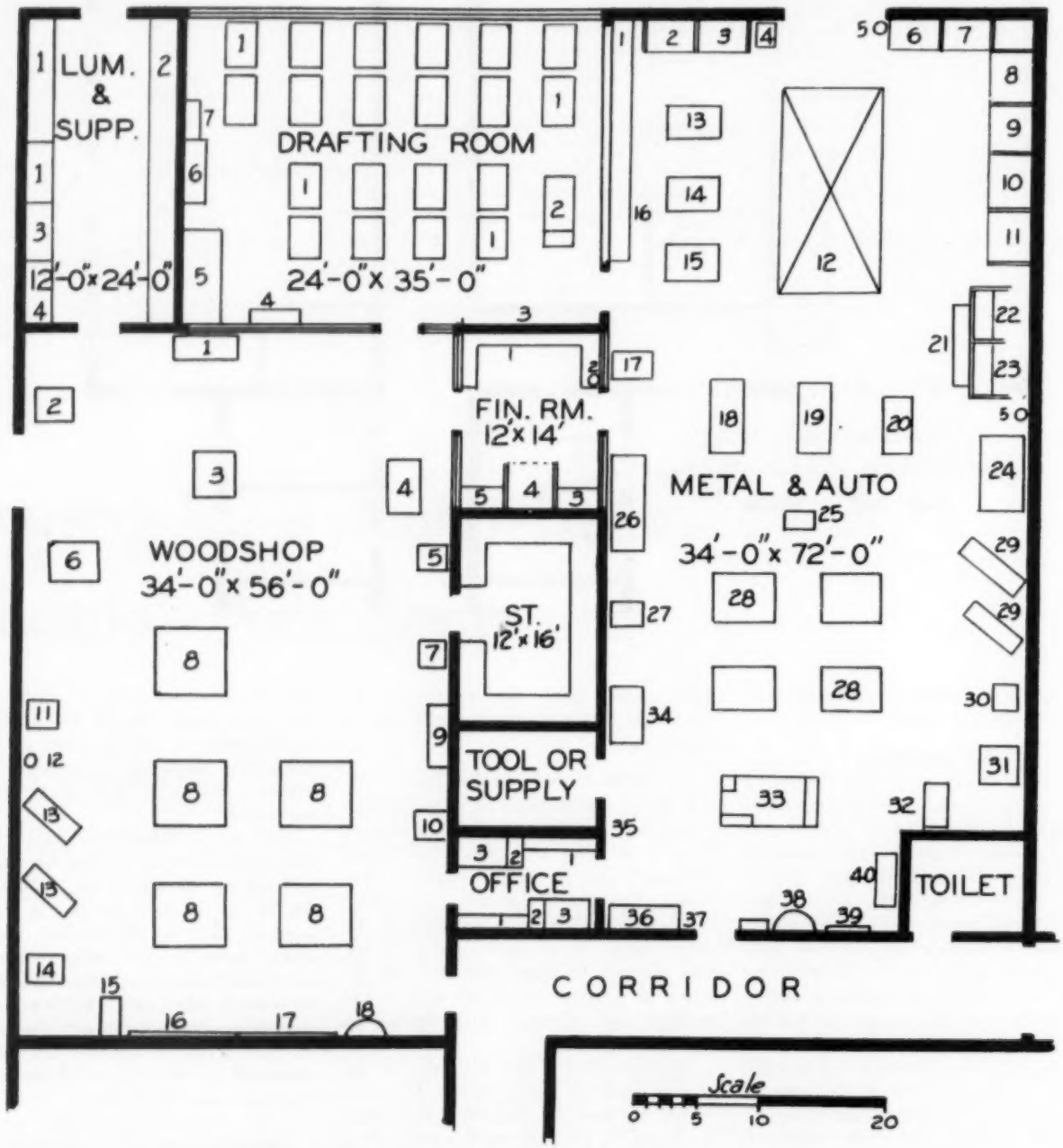
More specifically, each instructor in this plan is a *general-shop instructor*. Too often instructors have felt that the general shop is typical of the very small school where a one-instructor shop program is in effect. Actually, the addition of staff may suggest more teacher specialization, but to provide, for example, unit shop *printing* or unit shop *machine shop* is opposed to this plan. This plan offers instead a broader *graphic arts* and *general metal* respectively. This, therefore, provides for some instructor specialization but tends to broaden the specialization to a family of related industrial technology. Should the department be expanded to include more shops and instructors, this emphasis would call for a broader offering as well as greater specialization.

Each shop is departmentalized into self-contained activities. Except for the stock and special storage rooms, each activity has its special tools located in the floor area set aside for the activity. This procedure seems to offer more work stations per square area; activities interfere less with each other; and instructional procedures are easier organized. There should be little argument against such a plan in communities where a rather conservative approach must be taken.

Although some oil is produced in 27 states, more than half of all that has been produced in the United States to date has come from 164 large fields in 14 states. Texas has 64 of these giant oil fields, each with estimated ultimate production of 100 billion barrels or more. California has 34, Oklahoma 22, and Louisiana 15. — *Petroleum Newsnotes*

Shop Layouts by

AMOS D. COLEMAN
State Supervisor of Industrial Arts
Springfield, Ill.



Shop layouts by Amos D. Coleman, state supervisor of industrial arts, Springfield, Ill.

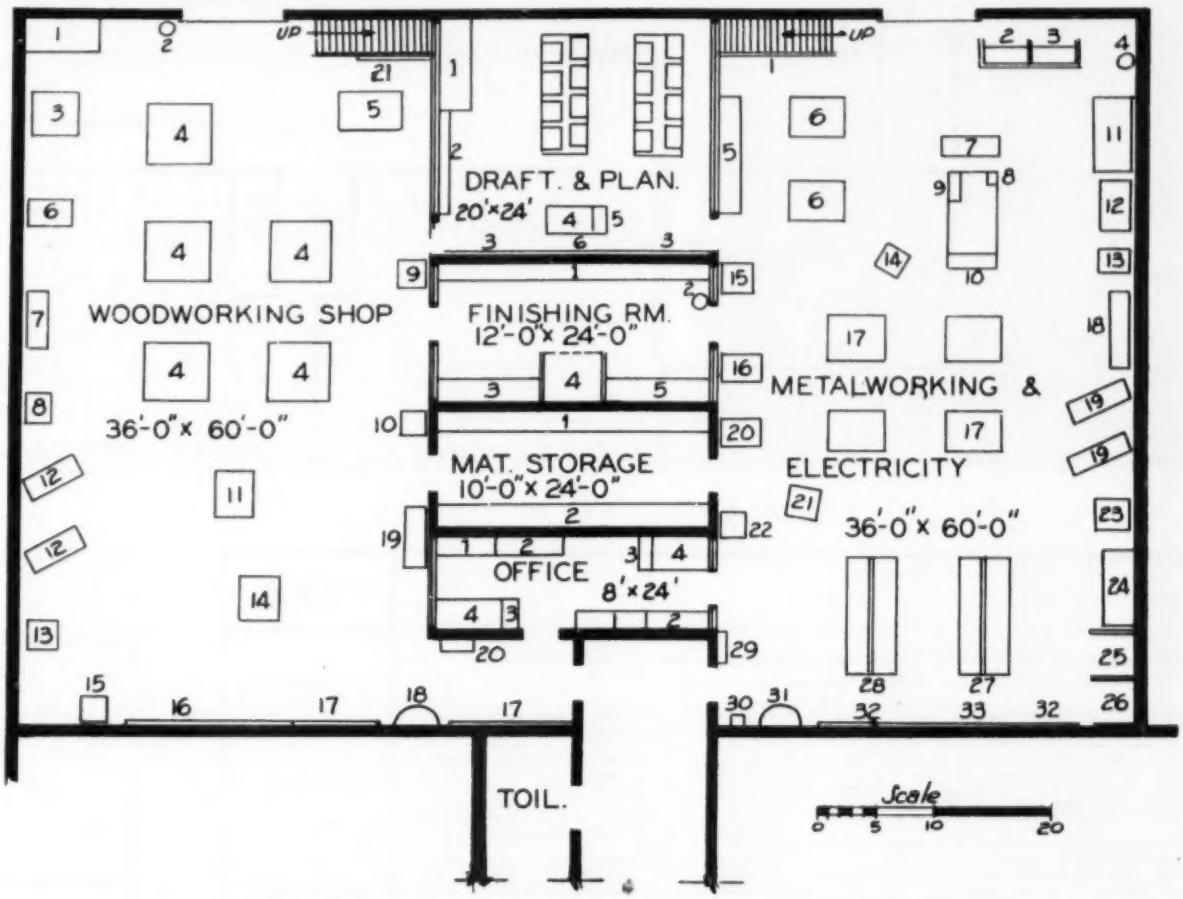
Lumber and supply room: 1. plywood storage; 2. lumber storage; 3-4. supply cabinets

Woodshop: 1. jointer; 2. bandsaw; 3. table saw; 4. glue table; 5. drill press; 6. planer; 7. sander and dust collector; 8. five 4-boy woodworking benches; 9. woodwork hand tools; 10. grinder; 11. mortiser; 12. fire extinguisher; 13. wood lathes; 14. shaper; 15. jig saw; 16. chalkboard; 17. bulletins; 18. wash fountain

Finishing room: 1. drying racks; 2. fire extinguisher; 3. finishing table; 4. exhaust; 5. spray booth

Office: 1. storage; 2. files; 3. desk

Metal and auto shop: 1. air compressor; 2. transformer; 3. differential; 4. battery charger; 5. fire extinguisher; 6. 1-cylinder engine; 7. clutch; exploratory auto units; 8. core; 9. generator; 10. ignition; 11. brakes; and 12. cut-away chassis; 13. V-8; 14. L-head; 15. O.H. valve; 16. workbench; 17. surface grinder; 18. rear end assembly; 19. front end suspension; 20. transformer; 21. tool cabinet; 22 and 23. arc welding; 24. foundry unit; 25. anvil; 26. workbench; 27. drill press; 28. metalworking tables; 29. engine lathes; 30. grinder; 31. metal mill; 32. metal shaper; 33. rotary combination machine; 34. soldering bench; 35. bulletins; 36. stake plate; 37. bulletins; 38. wash fountain; 39. chalkboard; 40. metal hand tools



Two-teacher layout for teaching woodwork, metalwork, and electricity.
Amos D. Coleman, state supervisor of industrial arts, Springfield, Ill.

Woodworking shop: 1. crafts table; 2. fire extinguisher; 3. band saw; 4. five 4-student woodworking benches; 5. glue table; 6. jig saw; 7. woodwork hand tools; 8. grinder; 9. mortiser; 10. drill press; 11. table saw; 12. wood lathes; 13. shaper; 14. planer; 15. sander; 16. chalkboard; 17. bulletins; 18. wash fountain; 19. jointer; 20. first aid cabinet

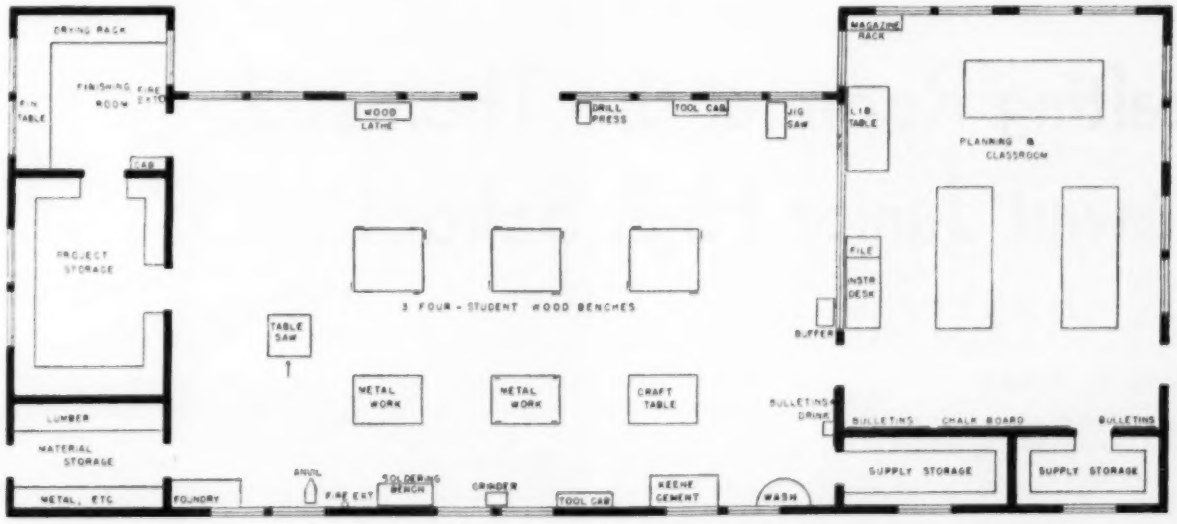
Drafting and planning room: 1. library table; 2. books and magazines; 3. bulletins; 4. instructor's desk; 5. file; 6. chalkboard

Finishing room: 1. drying racks; 2. fire extinguisher; 3. finishing table; 4. spray booth; 5. finishing table

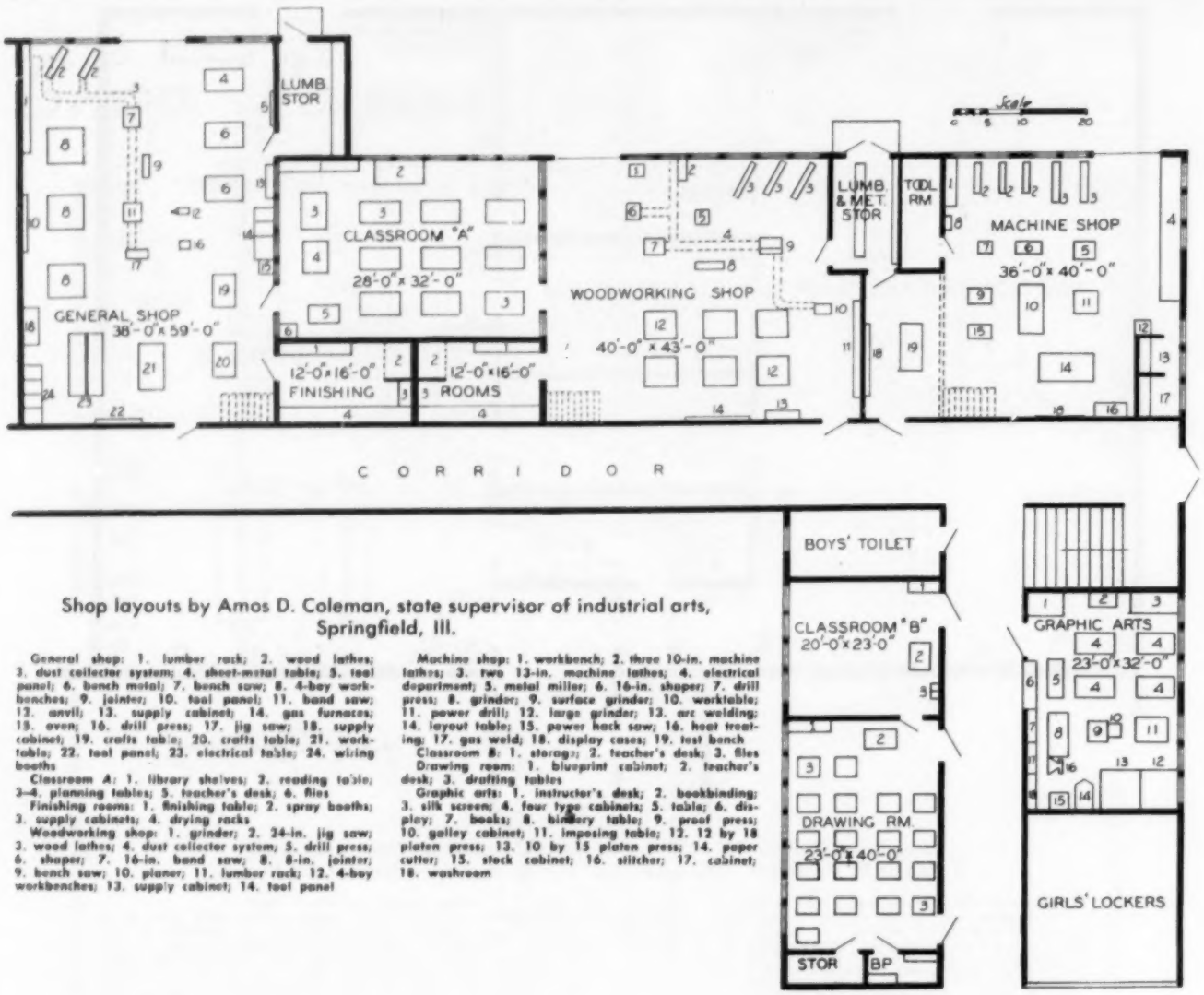
Material storage; 1. storage and supplies cabinets; 2. lumber storage

Office: 1–2. storage cabinets; 3. files; 4. desks

Metalworking and electricity: 1. supply cabinet under stairs; 2. arc welding; 3. gas welding; 4. fire extinguisher; 5. workbench; 6. crafts tables; 7. stake plate; 8. rotary combination machine; 9. brake; 10. forming plate; 11. foundry unit; 12. soldering bench; 13. heavy duty grinder; 14. anvil; 15. metal mill; 16. surface grinder; 17. four-bench metal tables; 18. metalwork hand tools; 19. engine lathes; 20. metal shaper; 21. power hack saw; 22. drill press; 23. tool grinder; 24. test bench; 25–26. wiring booths; 27–28. electricity bench; 29. first aid cabinet; 30. drinking fountain; 31. wash fountain; 32. bulletins; 33. chalkboard



Shop layout by Amos D. Coleman, state supervisor of industrial arts, Springfield, Ill.



Shop layouts by Amos D. Coleman, state supervisor of industrial arts, Springfield, Ill.

General shop: 1. lumber rack; 2. wood lathes; 3. dust collector system; 4. sheet-metal table; 5. tool panel; 6. bench metal; 7. bench saw; 8. 4-boy workbenches; 9. jointer; 10. tool panel; 11. band saw; 12. anvil; 13. supply cabinet; 14. gas furnaces; 15. oven; 16. drill press; 17. jig saw; 18. supply cabinet; 19. crafts table; 20. crafts table; 21. worktable; 22. tool panel; 23. electrical table; 24. wiring booths

Classroom A: 1. library shelves; 2. reading table; 3-4. planning tables; 5. teacher's desk; 6. files

Finishing rooms: 1. finishing table; 2. spray booths; 3. supply cabinets; 4. drying racks

Woodworking shop: 1. grinder; 2. 24-in. jig saw; 3. wood lathes; 4. dust collector system; 5. drill press; 6. shaper; 7. 16-in. band saw; 8. 8-in. jointer; 9. bench saw; 10. planer; 11. lumber rack; 12. 4-boy workbenches; 13. supply cabinet; 14. tool panel

Machine shop: 1. workbench; 2. three 10-in. machine lathes; 3. two 13-in. machine lathes; 4. electrical department; 5. metal miller; 6. 16-in. shaper; 7. drill press; 8. grinder; 9. surface grinder; 10. worktable; 11. power drill; 12. large grinder; 13. arc welding; 14. layout table; 15. power hack saw; 16. heat treating; 17. gas weld; 18. display cases; 19. test bench

Classroom B: 1. storage; 2. teacher's desk; 3. files

Drawing room: 1. blueprint cabinet; 2. teacher's desk; 3. drafting tables

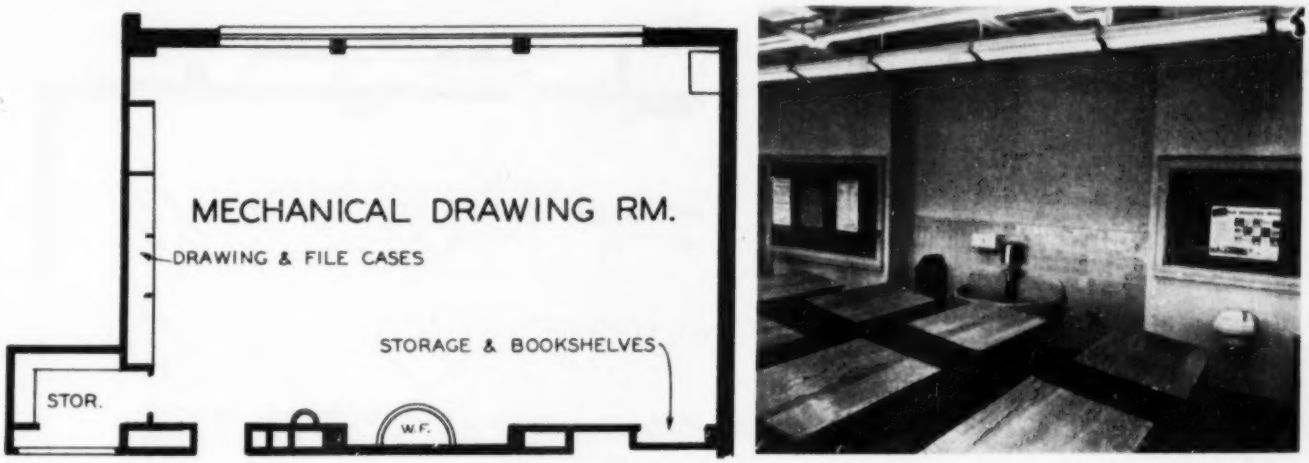
Graphic arts: 1. instructor's desk; 2. bookbinding; 3. silk screen; 4. four type cabinets; 5. table; 6. display; 7. books; 8. bindery table; 9. proof press; 10. galley cabinet; 11. imposing table; 12. 12 by 18 platen press; 13. 10 by 15 platen press; 14. paper cutter; 15. stock cabinet; 16. stitcher; 17. cabinet; 18. washroom

Drafting Room at the Thomas J. Stewart Junior High School

MERVYN T. JONES
Drafting Instructor
Thomas J. Stewart Junior High School
Norristown, Pa.

At times, many of us complain about our present teaching facilities, and very few of us ever have the opportunity to help plan new facilities. On the other hand, when we do have the opportunity, some of us are not prepared and, therefore, do not do a satisfactory job. Recently we made an addition to our school and it included a new drawing room which I had the pleasure of helping to plan. The experience of working with the supervisor, the principal, and the architect in the planning of this room was quite revealing.

From this experience a teacher learns



The new drawing room

many, many things. I won't try to enumerate these many things but I will make the following suggestions to teachers who may have a chance to plan such a room:

First, know exactly what is needed and be able to justify these needs.

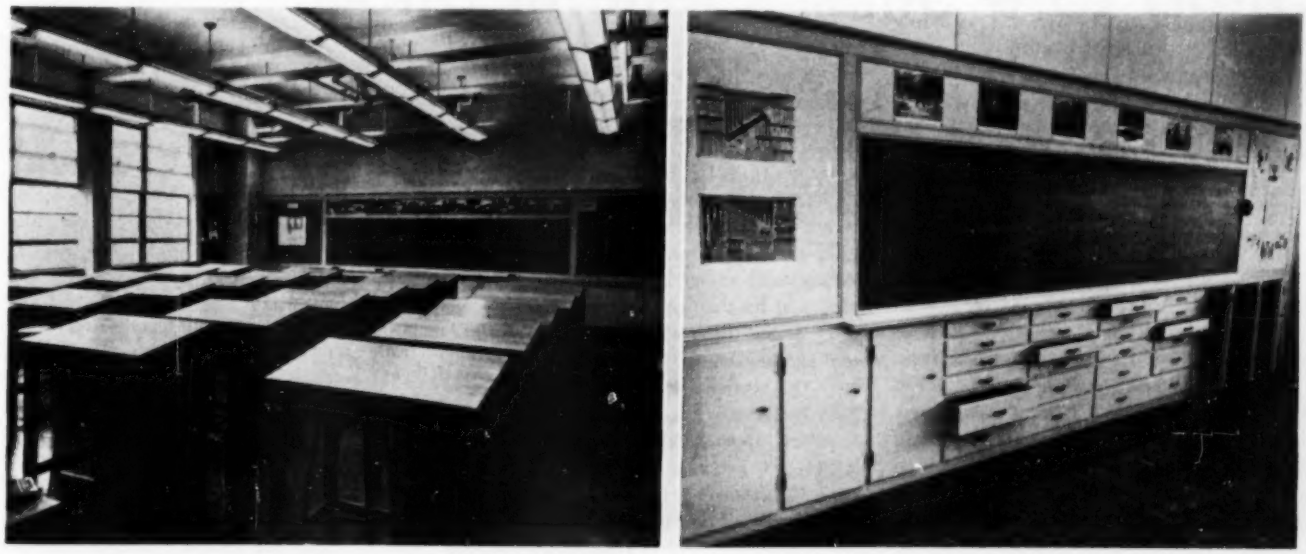
Second, be persistent — "stick to your guns" — keep in mind that you are planning for a great many children; don't be frightened by high prices or by colleagues who may say "is that necessary?"

Third, do a completely thorough job, talk with your architect; he will have more respect for you if he realizes you know what you are talking about.

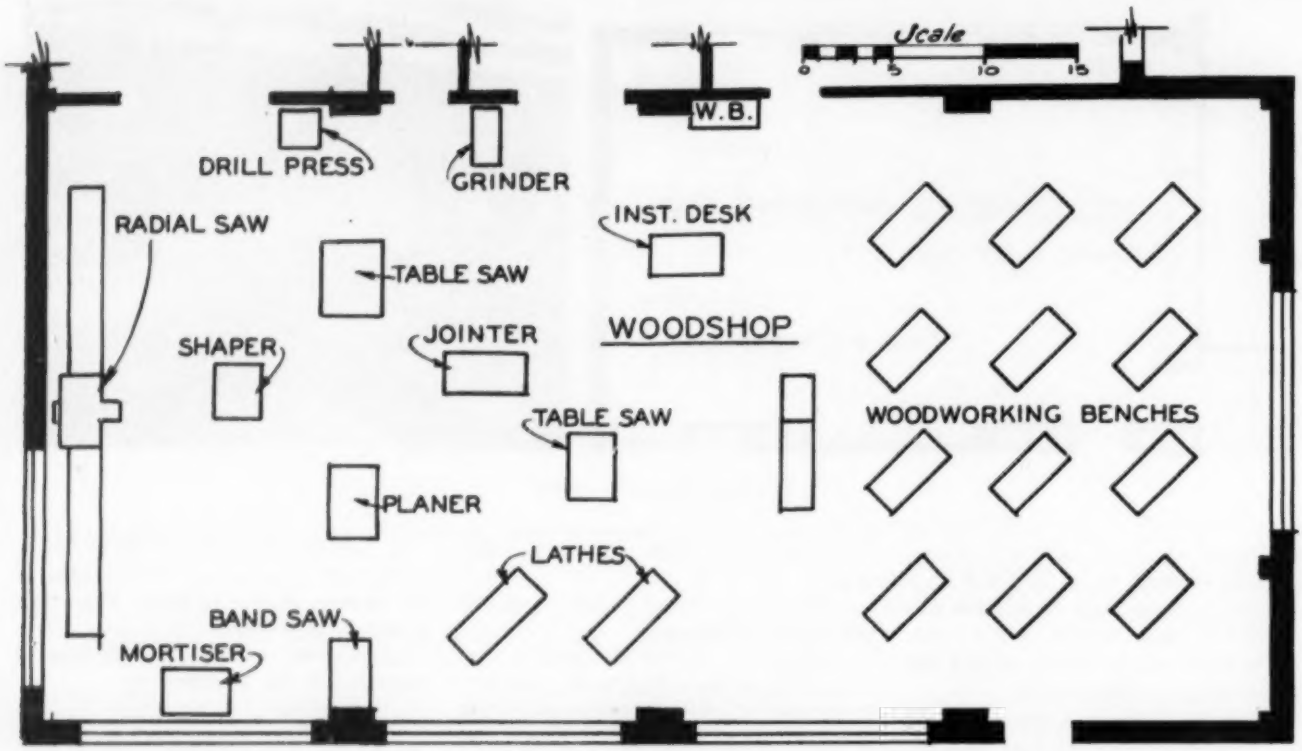
Listed here are the outstanding features of our new drawing room which make it attractive and pleasant for both students and teachers.

1. Ceiling and walls are acoustically treated.
2. Fluorescent lights produce uniform shadow-free illumination.
3. Floor is of asphalt tile (green).
4. Furniture has a light finish (natural).
5. Color of ceiling is white, walls pale green, woodwork soft color.
6. Ventilation system produces fresh air continuously.
7. Chalkboards are at both front and rear of room and are at correct height.
8. Cork boards are conveniently located and there are plenty of them. We have eight.
9. Closets are in front of room and at rear. One in the front is for paper, books, and drawing instruments. Two at the rear of the room — one for supplies, one for coats.
10. Storage of pupils' drawings, extra books, and large papers is in cupboards and drawers at rear of room. There is a drawer for each class.
11. Washing facilities and a drinking fountain also are provided.

A transparent, flexible plastic dressing which can be sprayed on from an aerosol bomb has been developed recently. It keeps out germs but lets the surgeon see how the wound is healing. Made with polyvinyl plastic in an ethyl acetate solution in which petroleum derivatives play an important role, it is used for burns and other wounds. It is more comfortable than pressure dressings and peels off easily. — *Petroleum Newsnotes.*



Arrangement in the drafting room at the Thomas J. Stewart Junior High School



Layout of woodshop at the F. W. Olin School at Atlanta, Ga. P. E. Babcock, executive director, Vocational Education Service, Atlanta, Ga.

Transition From a Small Woodworking Shop to a Small General Shop

ARCHIE E. THOMAS
Yoncalla, Ore.

The course of study should be such as would carry out the following objectives:

a) Avocational Developments: Experiences that enable the student to discover his abilities and aptitudes which might later be followed as a hobby.

b) Consumers' Knowledge and Skills: Shop experiences present such knowledge and skills in the choosing of industrial materials as to make boys and girls better choosers and users; as, knowing the good materials from the bad.

c) Developmental Mechanical Experiences: Such experiences would tend to make the pupil literate both in knowledge, feeling, and understanding of causes and effects in mechanical things.

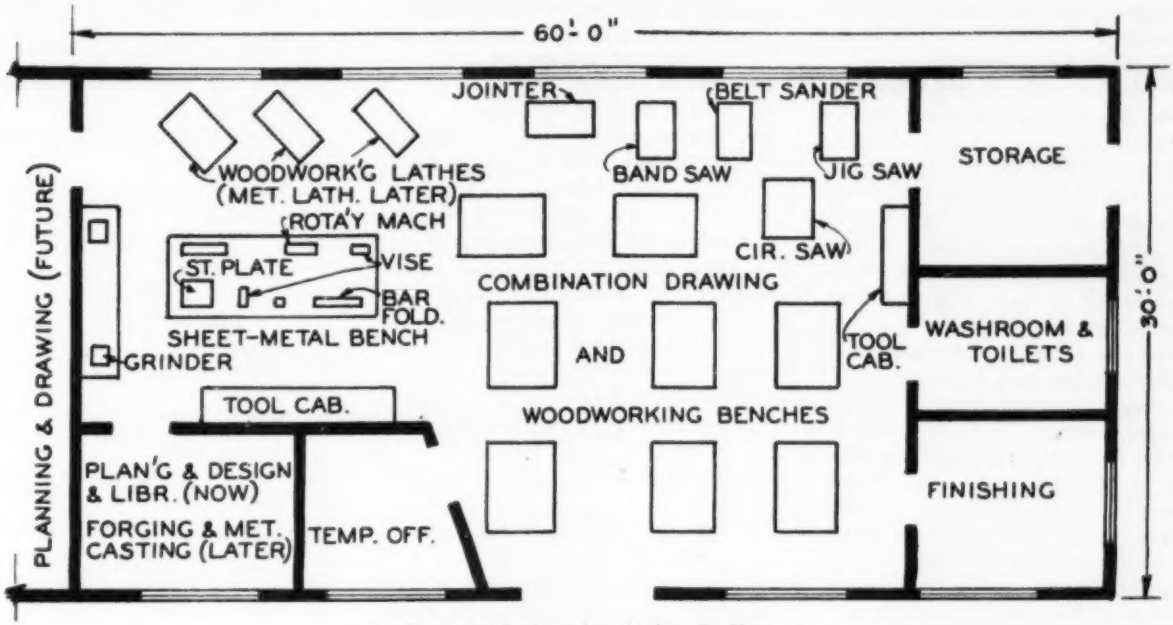
d) Social Interest, Knowledge, Habits, and Appreciation: Such experiences will help the student in understanding industries better so that he will begin to have a better understanding of how he must master the arts.

e) Vitalization of Other Subjects: An understanding of how a motor works attained through actual shop experience in working on a motor will undoubtedly stimulate a student to tell others about it. To write about intimate experiences is the first prerequisite to expression. therefore English can be vitalized by the shop as can also science, art, social science, and mathematics.

f) Exploration and Guidance: Experiences with different materials and semi-trade practices give the student a taste of what work is like and also show whether his capacities and aptitudes are fitted for any of them. Guidance under the tutelage of a master craftsman is of utmost significance.

Pupil Participation in Shop Organization in the General Shop

1. Purpose of Organization



Small general shop by Archie E. Thomas

a) To train students in leadership and fellowship. All students must be given an opportunity to exert leadership and to act as co-operative followers. All students should assume the responsibilities assigned them.

b) To acquaint the student to some extent with the system of personnel organization used in many industries.

c) To relieve the instructor of certain routine tasks.

2. Plan of Organization

The number of pupils participating depends upon the size and type of shop. In this plan are listed only those items that are essential in a small general shop.

a) Shop foreman (elected by the class for 9 weeks)

The duties of the shop foreman are to assist the instructor in the following:

1) Checking out supplies and filling out requisition sheets.
2) Oversee entire personnel system.
3) Call clean-up and see that clean-up crews are on the job.
4) Check equipment to see if oiling crew have done efficient job.
5) Check tool cabinet to see if all tools have been replaced.
6) Report condition of tools in cabinet.
7) Assist maintenance crew.

b) Safety engineer (elected by the class for 9 weeks)

The duties of the safety engineer are to:

1) Check the shop at beginning and end of each period for proper ventilation and light.
2) Be responsible for the general shop safety program and its improvements.
3) Put up safety posters and information.
4) Replenish first-aid cabinet when necessary.

c) Stock-room man

1) Is responsible for arrangement and storage of materials.
2) Fill out requisition sheets.
3) Keep inventory of material.

d) Oilers

Duties of oilers:

1) Oiling machines at close of class.
2) Checking condition of machines, belts, motors, guards, and other details at end of period.
3) Report anything needing attention.

e) Maintenance crew

Duties:

1) Repair all shop equipment under close supervision.
   (*a*) Install new parts on machines.
   (*b*) Make minor repairs on machines.
   (*c*) Help foreman recondition tools.

f) Secretary (elected by the class for 9 weeks)

Duties are to assist instructor in:

1) Keeping records of all purchases.
2) Recording of all requisitions.
3) Do all other filing and recording.

g) Librarian (elected by the class for 9 weeks)

Duties:

1) Keep the planning center in good order.
2) Check out books and keep track of library cards.
3) Keep supply of plan sheets and job sheets on hand.
4) Check project files, books, and magazines at end of period.

h) Finishing room manager

Duties:

1) Take care of all finishing supplies.
2) Keep a constant check on all paint, varnish, and shellac brushes to make sure that they are in good order.
3) Keep the finishing cabinet and bench in neat and proper order.
4) Report any needed finishing supplies to the foreman.

i) Clean-up crew

Duties:

1) Brush off machines.
2) Sweep floors.

Officers not elected are rotated from one position to another by means of an assignment wheel or some other method.

Some of the citizenship and personal development values made possible through participation in shop management are:

1. The student receives a better understanding of the operation of local,

county, state, and national governments.
2. He learns to co-operate.
3. He learns leadership and fellowship.
4. He gets a better sense of responsibility.
5. The traditional bad boy changes his pattern of behavior when given an opportunity to lead in the shop.
6. Timid boys who, because of their home environment, have had no opportunity to lead, find that they have leadership ability.
7. He gets a better understanding of the organization of industries.

The class as a whole benefits because the teacher has more time to devote to instruction in its various forms, the chief purpose of his employment. The teacher also benefits, as he is relieved of some uninteresting and time-consuming work, but he must always be the teacher.

Units to be incorporated in the tentative course of study for a small general shop.

1. Elementary mechanical drawing (later to be expanded to general mechanical drawing).
2. General woodworking and finishing.
3. Elementary metals (sheet metal) later to be expanded to general metals to include art metals, forging and heat treating, welding, metal casting, and machine-shop practice.
4. Elementary electricity

Other units such as plumbing, leathercrafts, home mechanics, and plastics, may be added to or alternated with the foregoing units.

Operations a Boy Should Be Able to Perform at the End of Drawing Unit

1. Plan and design work.
2. Use drafting equipment.
3. Make working drawing.
4. Freehand sketching.
5. Line techniques.
6. Lettering.
7. Tracing and blueprinting.
8. The economical use of materials.

Things the boy should know:

1. Name and care of drafting equipment.
2. Trades in which drafting is used.
3. Qualifications and training needs.
4. Advantages and disadvantages.

Operations a Boy Should Be Able to Perform at the End of Woodworking Unit

1. Make a working drawing.
2. How to lay out stock.
3. How to use stock economically.
4. Make a bill of material.
5. Properly use sandpaper.
6. Construction of simple joints: butt, dado, cross-lap, mortise-and-tenon, dowel.
7. To construct and use bit stop.
8. Care of brushes.
9. To use finishing materials.
10. How to use and care for the following tools: rule, try square, marking gauge, T bevel, backsaw, ripsaw, crosscut saw, planes (jack, smooth, and block), bits, drills, countersink, wood chisels and gouge, wood fasteners, vise, bench hook, miter box, hand scraper, cabinet scraper, wood files and rasps, and clamps.

Things the boy should know:

1. Recognize 6 commercial woods.
2. Recognize kinds, sizes, and uses of screws.
3. Recognize kinds, sizes, and uses of nails.
4. Recognize kinds, sizes, and uses of corrugated fasteners.
5. The name and proper use of tools mentioned under operations a boy should be able to do.
6. Lumbering
   a) Logging processes
   b) Milling processes
   c) How seasoned
   d) Standard dimension into which lumber is cut for framing, sheeting, siding, flooring, trim, interior and exterior, and furniture construction.
7. Woodworking trades
   a) Qualifications and training needs
   b) Advantages and disadvantages
8. Consumer appreciation
   a) Good and bad features
9. Wood products
   a) Fuel, lumber for construction and furniture making, fence posts, mine timbers, poles, pilings, pulpwood, cooperage, railroad ties, shingles, laths, veneers, plywoods, etc.
10. Wood derivatives
    a) Charcoal, wood alcohol, turpentine, oil, tanning materials, dyes, paper, celluloid, artificial fabrics, drugs, gum, resins, etc.
11. Proper solvent for different types of finishing material.

Operations a Boy Should Be Able to Perform at End of Metal Unit

1. Scribe around a template using a scratch awl.
2. Cut sheet metal with the squaring shears.
3. Cut tin with combination tinners' snips.
4. Lay out circles with dividers.
5. Use a mallet for straightening, shaping, and seaming.
6. Make a grooved seam, using a hand groover.
7. Solder bright tin.
8. Lay out work from templates and drawings.
9. Insert blade in hack-saw frame and cut metal stock.
10. Lay out, centerpunch, and drill holes in metal.
11. Use files for filing metal to a line and truing up surfaces.
12. Clean files with file card and brush.
13. Use emery cloth for finishing metal surfaces.
14. Assemble bench-metal projects by riveting.
15. Set up and use the drill press for drilling holes.
16. Sharpen hand tools on the grinder.
17. Shape a soldering copper.
18. Lighting blowtorch or gas furnace.
19. Heating soldering copper.
20. Tinning soldering copper.
21. Applying flux.
22. Soldering.
23. Hemming, single and double.
24. Measuring wire.
25. Setting down (hand and machine).
26. Riveting.
27. Grooving.
28. Using machines.
29. Wiring.

Things the boy should know:

1. The names of common hand tools and machines used in the shop.
2. How to read a working drawing.
3. The economical use of materials to prevent waste.
4. The composition of solder.
5. The contents and purposes of soldering flux and cleaning solutions.
6. The difference between bright tin and galvanized iron.
7. How to read a steel rule to $\frac{1}{16}$ inch.
8. The names and characteristics of iron, steel, copper, brass, and aluminum.
9. Names and use of common files.
10. Proper hack-saw blades to use for various jobs.
11. Correct lubricants for use on different jobs.
12. The designation of sizes of drills.
13. Correct adjustment of guards and tool rest on the grinder.
14. How to hold material when grinding.
15. How to grind tools without drawing the temper.

Operations a Boy Should be Able to Perform at the End of Unit in Elementary Electricity

1. Reading and making wiring diagrams.

2. Removing insulation and making rat-tail and tap splices.
3. Connecting dry cells in series and in parallel.
4. Wiring a bell and buzzer and two push buttons so that either the bell or the buzzer may be operated separately.
5. Making an extension cord.
6. Testing and replacing a fuse.
7. Reading an electric meter.
8. Tying an underwriter's knot.
9. Figuring the resistance of a circuit by Ohm's law.
10. Using a voltmeter and an ohmmeter.
11. Cleaning and adjusting breaker points.
12. Installing a three-way switch.

Things a boy should know:

1. Sources of electric current, conductors and their uses, and the meaning of voltage, ampere, watt, and resistance.
2. Direct and alternating currents.
3. Distinguishing between series and parallel circuits.
4. Resistance in creating heat.
5. The function of the electric magnet in buzzers and meters.
6. Types of electric light and their efficiency.
7. The extent of vocational opportunities in the electrical field.

Typical jobs for this unit:

1. Wiring three bells in parallel.
2. Installing one bell which will operate from two push buttons.
3. Installing a light that will operate from either of two switches.
4. Constructing an extension cord for a lamp.
5. Making an electric soldering copper.
6. Making an electric toaster.
7. Making an electric hot plate.

Operations a Boy Should be Able to Perform at the End of Unit in Plastics

1. Cut plastics.
2. Frost the edges.
3. Laying out patterns, design and decorate.
4. Cementing.
5. Heating and shaping acrylic plastics.
6. Buffing and polishing.
7. Coloring and staining.
8. Mounting specimens in acrylic plastics.

Things a boy should know:

1. Common types and uses of plastics.
2. The names of common tools used in plastic.
3. The economical use of materials to prevent waste.
4. The composition of plastics.

Operations a Boy Should Be Able to Perform at the End of Leather Craft Unit

1. Layout of pattern
2. Selection of leather
3. Transfer of pattern
4. Cutting
5. Sponging
6. Edging
7. Finishing
8. Lacing
9. Cementing
10. Riveting
11. Sewing (hand)
12. Sewing (machine)

Things the boy should know:

1. Names of tools and equipment used in leathercraft.
2. Trade terms.
3. Old and new methods of tanning.
4. Common uses of leather.

Operations a Boy Should Be Able to Perform at the End of Plumbing Unit

1. Rewash and repack a leaking compression faucet.
2. Place a new fuller ball in a fuller faucet.
3. Repack a globe valve.
4. Renew gasket on steam valve.
5. Cut and thread a piece of pipe and a small rod.
6. Know and assemble pipe fittings.
7. Cut standard soil pipe.
8. Run water line and hook up a sink.

Things a boy should know:

1. Safety.
2. Points to remember in achieving safety.
3. Maintaining and operating a blowtorch.
4. Opening drains.
5. Pipe sizes.
6. Pipe fittings.
7. Packing a joint.

Occupational Information To Be Covered in Drawing Unit

1. Related information.
   a) Manufacture of common types of drawing paper, pen, and drawing ink.
   b) Composition of drawing ink.
   c) Manufacturing of maps.
   d) How geometric design has influenced architecture through the ages.
   e) Possible geometric designs.
2. Job opportunities for draftsmen.
   a) Qualifications needed.
   b) Hazards that are to be encountered.
   c) Working conditions.
   d) Chances for advancement.
   e) How permanent the occupation is.
   f) Organization and management.
   g) Wages earned.
   h) Time for recreation.
   i) Recreational facilities.
3. Means of covering this information.
   a) Visits to industry.
   b) Study assignments.
   c) Talks by men from industry.
   d) Motion pictures and slides.
   e) Charts and talks by the instructor.

Occupational Information To Be Covered in a Woodworking Class

1. Typical woodworking trades.
   a) Bench work
   b) Cabinetwork — furniture manufacturing, sash and door manufacturing
   c) Patternmaking
   d) Carpentry
   e) Millwork
      1) Lumber mills — logging operations
      2) Pulp mills
         a) Wood derivatives: charcoal, wood alcohol, wood tar, wood gases, turpentine, oils, tannins, dyes, resins, cellulose products (rayon, paper, pyroxylin, celluloid, artificial fabrics, varnishes, drugs)

Occupational Information To Be Covered in Sheet Metal Unit

1. Related information.
   a) Manufacturing of sheet metal — iron, copper, brass, tin, zinc (galvanizing).
   b) Types of sheet metal.
   c) Gauges of sheet metal and how sold.
   d) Uses of sheet metal in industries.
   e) Methods of constructing curves and irregular shapes in industry.
   f) How metal coatings are applied to iron.
   g) Composition and properties of solder and fluxes.
   h) Why use copper for transferring heat.
   i) Properties of iron and steel.
   j) Processes used in the manufacture of iron.
   k) Types of iron and steel.
   l) Impurities of iron and steel.
   m) Uses of iron and steel.
   n) Iron ore from the mine to the furnace.

2 and 3 same as 2 and 3 under drawing unit.

Occupational Information To Be Covered in Elementary Electricity

1. Related information.
   a) Uses of electricity in industry.
   b) Manufacture of materials used for conductors.
   c) Manufacture of materials used for insulation.
   d) Sizes and manufacture of wire.
   e) Domestic use for electricity.
   f) History of early developments in electricity.
   g) Industrial applications of wet cell and storage cell.
   h) Manufacture of dry cells.

2 and 3 same as 2 and 3 under drawing unit.

Occupational Information To Be Covered in Unit of Plastics

1. Related information.
   a) Uses of plastics in modern industries.
   b) Manufacturing process used in making different kinds of plastics.
   c) Names and colors of plastics.
   d) Names of cements and solvents.
   e) Manufacturing of cements and solvents.

2 and 3 same as 2 and 3 under drawing unit.

Occupational Information To Be Covered in Leathercraft

1. Related information.
   a) Industrial practices.
   b) Manufacturing of leather and leather goods.
   c) Manufacturing of substitutes for leather.
   d) Modern methods of tanning.
   e) Manufacturing of imitations.
   f) Manufacturing of lacings, rivets, fasteners, tools, and machines used in leather trades.

2 and 3 same as 2 and 3 under drawing unit.

It would be futile to attempt in general shop program an exploration of all the many materials which are used in industry.

Too frequently, however, industrial-arts experiences include too few of the hundreds of materials, tools, and machines which the world's markets supply, each with characteristics which make it most appropriate for some specific purpose.

To confine one's efforts to a narrow field of industrial material is out of step with the rapidly expanding field of industrial materials in use at the present time.

The use of power tools has a definite value in interpreting the present industrial civilization to adolescent boys and girls. It is, therefore, a responsibility of industrial-arts teachers, through assigned study, class discussion, visits to industrial plants, shop work, and other desirable forms of industrial-arts activities, to develop in their pupils an intelligent understanding of the power age in which we live.

Books have a peculiar significance in industrial-arts shops. They are not used as texts very often, but serve mostly as sources of information. Their use as reference material is increasing. Several things may account for this situation. Not so long ago the teacher carried all of the essential knowledge in his own mind and passed it on to his pupils by lectures and actual demonstrations with tools and materials. Imitation is still a very good way of learning, but with the accumulation of good books, and the recognition given to the interests of individual pupils, school programs are growing in breadth. The time has now arrived when a library of good books is an essential part of the equipment of every progressive industrial-arts shop, and evidence of their frequent use is an indication of one factor in good teaching.

Our present shop is inadequate for the transition. We are contemplating a building separated from the main building.

The accompanying plan is the plan of the first unit to be built. This shop is to be 30 feet wide and 60 feet long, with windows and doors arranged as indicated.

The temporary office will be used for welding equipment in the future.

No space for blackboards has been indicated as the writer prefers blackboards on rollers. If a demonstration is given at the metal bench, the blackboard can be rolled to it, or to any other part of the shop.

There is ample room between windows and doors for necessary charts and bulletin boards.

A surprising amount of storage space is provided in each bench by built-in drawers and cabinets. The drawers may be assigned to the students as lockers. Some may be reserved to provide storage for supplies and equipment near the point where they are to be used.

A shop of this kind can be established in almost any school where room is available.

BASIC TEXTS

Bollinger, J. W., *A Course in Sheet Metal Work* (Milwaukee, Wis.: The Bruce Publishing Co.).

Feirer, John, *General Metals* (McGraw-Hill Book Co., Inc., 1952).

Fryklund and La Berge, *General Woodworking* (Bloomington, Ill.: McKnight and McKnight, 1936).

Griffith, Ira S., *Essentials of Woodworking* (Peoria, Ill., 1937).

Lunt, J. R., *Everyday Electricity* (New York, N. Y.: Macmillan Co., 1934).

Newkirk, *General Shop for Everyone* (New York, N. Y.: D. C. Heath & Co., 1952).

Newkirk, Hewitt, and Zutter, *Adventure With Plastics* (Boston, Mass.: D. C. Heath & Co., 1947).

Woollner, R. C., and Wittick, E. C., *General Mechanical Drawing for Beginners* (New York, N. Y.: Ginn and Co., 1932).

SUPPLEMENTARY TEXTS

Bedell and Gardner, *Industrial Arts for the General Shop* (Scranton, Pa.: International Text Book Co., 1947).

Cherry, Raymond, *General Plastics* (Bloomington, Ill.: McKnight and McKnight, 1947).

——— *General Leathercrafts* (Bloomington, Ill.: McKnight and McKnight, 1947).

Crawford, J. E., *Practical Electricity* (Milwaukee, Wis.: The Bruce Publishing Co., 1947).

Hobbs, *Working With Aluminum* (Milwaukee, Wis.: The Bruce Publishing Co., 1947).

Johnson, *Metal Spinning Designs* (Milwaukee, Wis.: The Bruce Publishing Co., 1947).

Johnson and Newkirk, *General Shop Electricity* (New York, N. Y.: Macmillan Technical Book Co.).

Mickel, Adelaide, *Leather Work* (Peoria, Ill.: Manual Arts Press, 1918).

Petersen, *New Tin-Can Projects* (Peoria, Ill.: Manual Arts Press, 1948).

Reagen and Smith, *Metal Spinning* (Milwaukee, Wis.: The Bruce Publishing Co., 1941).

Welch, *Elements of Sheet Metal Work* (Milwaukee, Wis.: The Bruce Publishing Co., 1941).

Zielke, Charles H., *Arc Welding* (Milwaukee, Wis.: The Bruce Publishing Co., 1947).

FREE AND INEXPENSIVE MATERIALS

Bedford Fine Leathers Ltd., handicraft supplies — leather, claycraft, weaving, plastics. Will send catalogue and often free instructions for the various crafts. 578 Seymour St., Vancouver, B. C., Canada.

The Bruce Publishing Company for instruction sheets. 400 N. Broadway, Milwaukee 1, Wis.

Manual Arts Press — Bennett Publishing Co. (instruction sheets). Chas. A. Bennett Co., Inc., 849 Duroc Building, Peoria, Ill.

General Finishes Sales and Service Co. (free folder, "Facts" about wood finishes). 1548 W. Bruce St., Milwaukee 4, Wis.

Nicholson File Co., free book, "File Filosophy," 48 pp. of information on kinds, use, and care of files. 47 Acorn St., Providence 1, R. I.

Free instruction book on Metal Spinning. Boice-Crane Company, 932 Central Ave., Toledo 6, Ohio.

Booklet, "Free Teaching Helps." South Bend Lathe, South Bend, Ind.

Behr-Manning, Troy, N. Y., Educational Department. Will send individual free copies of booklets. "Sandpaper, Its How and Why." "How to Sharpen," "Coated Abrasives for the Machine Shop."

Wall Chart. "Standard Technique in Forming Letters." Eberhard Faber Pencil Co., 37 Greenpoint Ave., Brooklyn 22, N. Y. Chart measures 16½ by 27 in., illustrates complete alphabet and all numerals, available to teachers only.

Boring Chart for Wood Screws. Greenlee Tool Company, 2136 Twelfth Street, Rockford, Ill. 14 by 21½ in. wall chart — gives wood-screw specifications and hole sizes to simplify selection of boring tools. Free to teachers.

The Meyer Card Company, 5323 W. Lake Street, Chicago 44, Ill. Decal-Craft Kit. Free assortment of decals, sufficient for 60 students, together with

instruction literature for grade, high school, or industrial-arts teachers.

Oliver Machinery Company, 1025 Clancy Avenue NE, Grand Rapids 2, Mich. "Woodworking Machinery" — a free eight-page bulletin featuring industrial types of equipment for school shops; for instructors only, one free copy of booklet on care and operation of circular saws and band saws.

Metal Goods Corporation, Dept. SS, 5239 Brown Avenue, St. Louis, Mo. Free booklets: "Making Aluminum Trays and Coasters," and "Copper Metalcraft."

FILMS

Catalog of Visual Aids, Visual Instruction Department, Oregon State College, Corvallis.

Catalog of Motion Pictures, Y.M.C.A. Motion Picture Bureau, 925 N.W. 19th Ave., Portland, Ore.

1000 and One, A Bibliography of Non-Theatrical Films, Published by the Educational Screen, 64 East Lake St., Chicago, 75 cents.

Catalog of Motion Picture Films, U. S. Bureau of Mines, N.W. Experiment Station, University of Washington, Seattle.

Instructive Talking Pictures, Erpi Picture Consultants, Inc., 250 West 57th St., New York. A number of the Erpi films are distributed by the Department of Visual Education, Oregon State College. These require special projectors equipped for sound-on-film projection.

Catalog of Educational Pictures, Bray Pictures Corporation, New York City.

Various industrial companies distribute their own films but a majority of these industrial films can be secured directly from one or another of the agencies suggested above and all of them can be found in the Bibliography, 1000 and One, published by the Educational Screen.

Industrial Education in Indianapolis High Schools

ALFRED P. SMITH
Supervisor, Industrial Arts
Indianapolis, Ind.

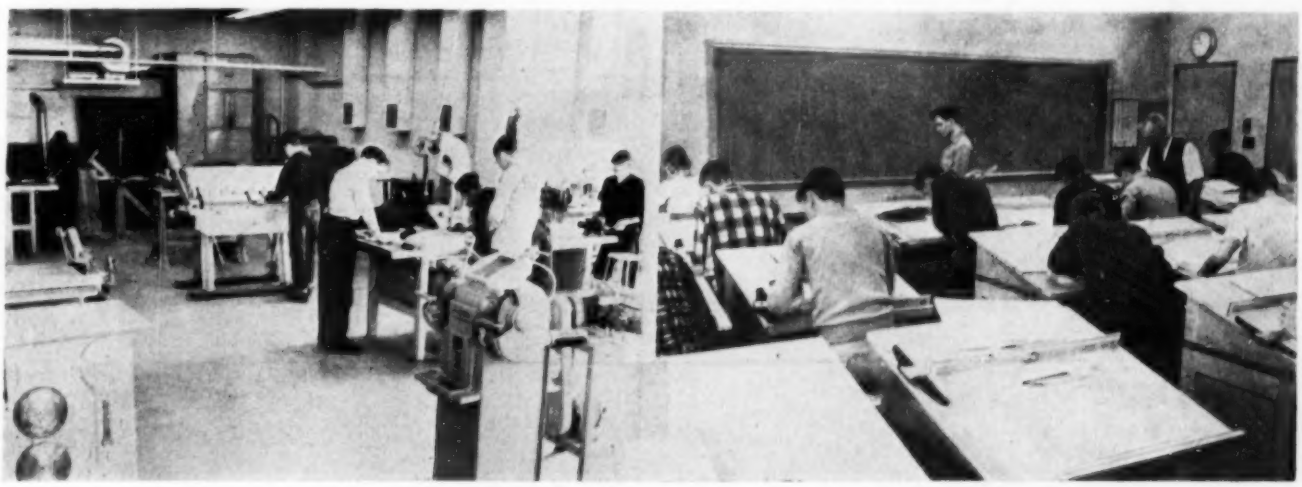
With the opening of school in September, 1953, Emmerich Manual Training High School began its sixty-first year in a new location. The second oldest high school in the city, it was originally chartered as the Industrial Training School and first occupied in 1893.

The name was changed to Manual Training High School, with the name of the first principal, Charles E. Emmerich, added after his death. The location of the school on the industrial south side was ideal at the time, and fitted the purpose of the school, which was essentially vocational training.

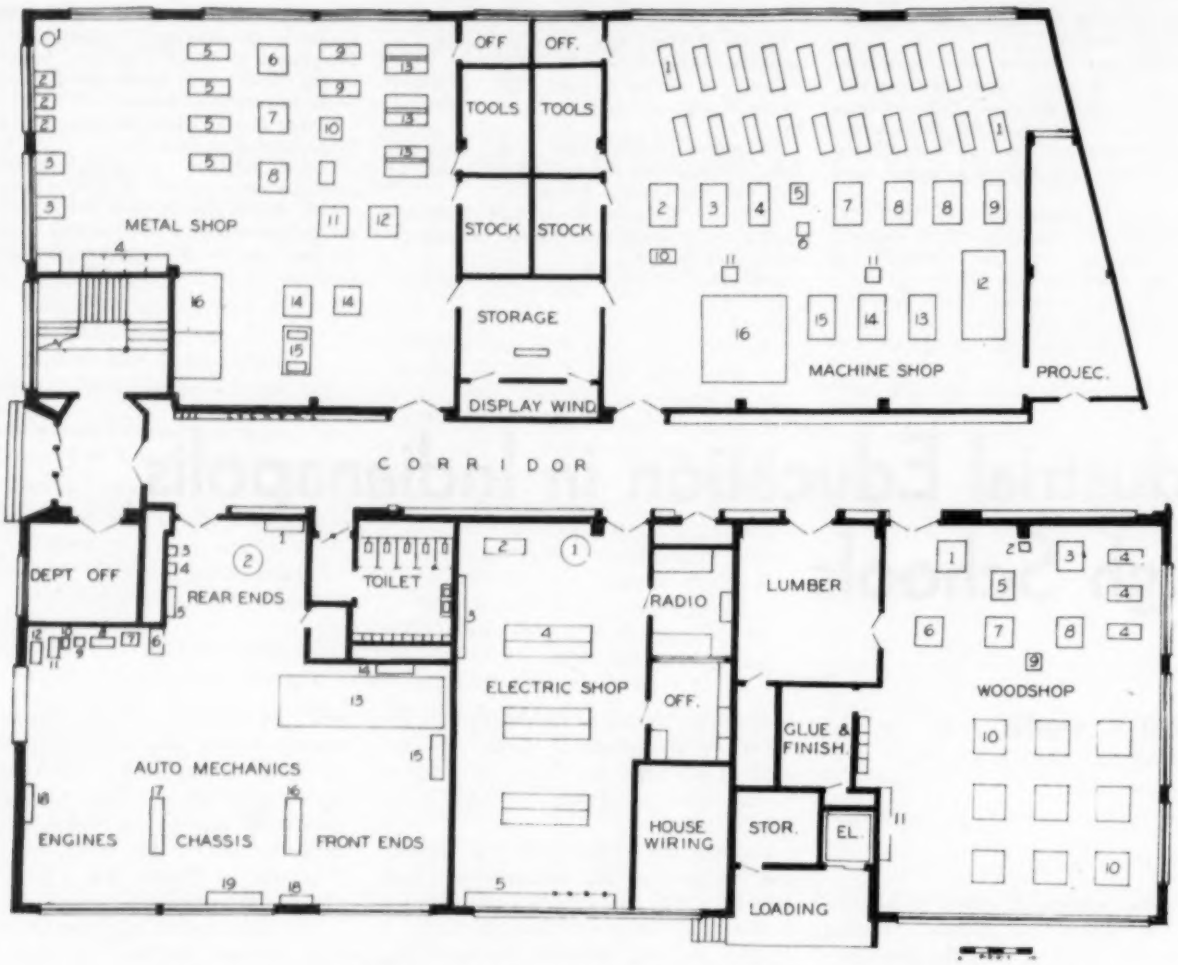
Changes due to the growth of the city and emphasis on the comprehensive high school in the educational philosophy of Indianapolis, made relocation desirable. A 15-acre plot was obtained approximately two miles farther south, closer to developing residential areas.

The auditorium unit is still under construction and should be completed soon. The shops are completed with the exception of certain pieces of equipment not yet placed. The shop unit is a one-story wing, with the cafeteria below. The drafting rooms and print shop are around the corridor close to the shops, which makes a unified department. The print shop is quite small, and will be inadequate if elections increase, but this is the first offering of printing at Manual and it was thought wise to start modestly.

The more modern equipment was moved from the old building, but most of the machinery was purchased for initial installation. New type locker-base benches were installed throughout the shops, and the drafting tables were custom made. The lift in the auto shop is the hydraulic scissor-jack type due to the location over the cafeteria.



Metal shop and drafting room at The Emmerich Manual Training High School, Indianapolis, Ind.



Industrial-arts shops, Emmerich Manual Training High School, Indianapolis, Ind.

Metal shop: 1. furnace; 2. acetylene welding; 3. forges; 4. soldering; 5. lathes; 6. drill press; 7. grinder; 8. drill; 9. spinning lathes; 10. band saw; 11. saw; 12. jointer; 13. benches; 14. grinders; 15. sheet metal; 16. arc welding

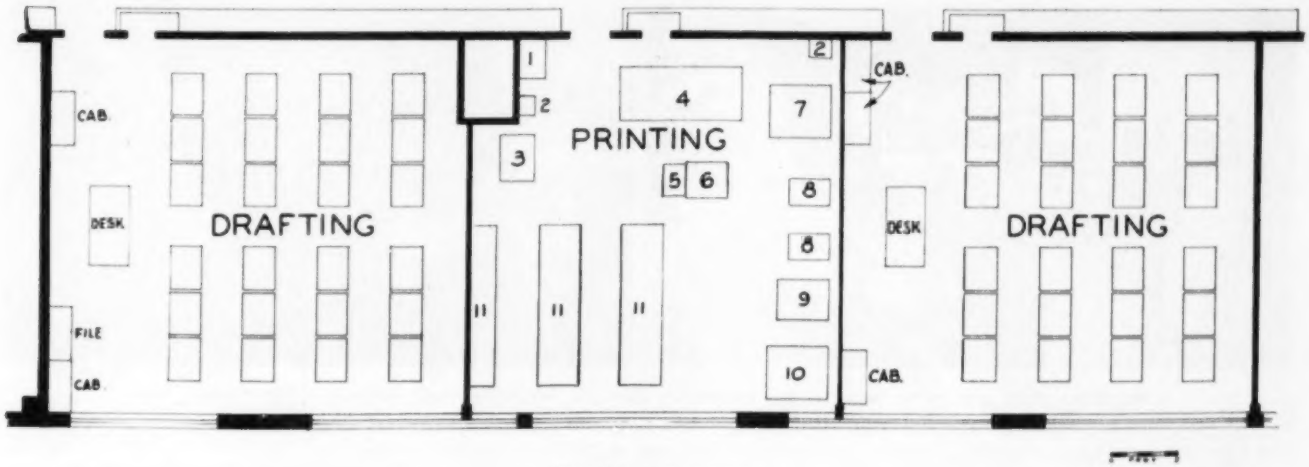
Machine shop: 1. engine lathes; 2. band saw; 3. drill press; 4. lathe; 5. shaper; 6. grinder; 7. jig borer; 8. mills; 9. shaper; 10. hack saw; 11. drill presses; 12. planer; 13. cutter grinder; 14. surface grinder; 15. cutter grinder; 16. inspection

Auto mechanics: 1. compressor; 2. wash fountain; 3. drill press; 4. grinder; 5. arm lathe; 6. desk; 7. hone; 8. distributor test; 9. valve grinder; 10. brake; 11. equipment; 12. analyzer; 13. lift; 14. lubrication; 15. lathe; 16. bench (front ends); 17. bench (engines); 18. tools; 19. bench (chassis)

Electric shop: 1. wash fountain; 2. lathe; 3. tools; 4. benches; 5. bench machines

Wood shop: 1. drill; 2. grinder; 3. shaper; 4. lathes; 5. circular saw; 6. radial saw; 7. jointer; 8. band saw; 9. sander; 10. nine benches; 11. tools

Wood shop and auto shop at the Emmerich Manual Training High School, Indianapolis, Ind.



Graphic-arts rooms

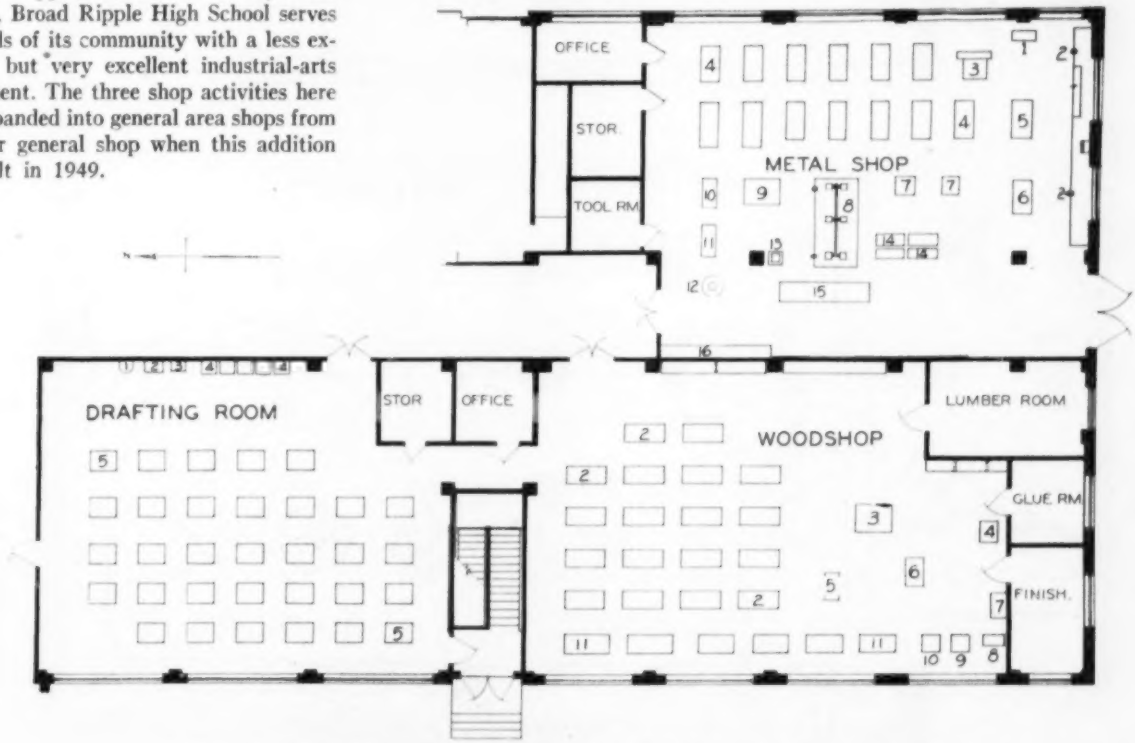
(At left) Layout for the drafting department. (Center) The printing area: 1. cabinet; 2. lavatory; 3. desk; 4. cutting table; 5. proofs; 6. stone; 7. 26-in. cutter; 8. 2-lever presses; 9. 10 by 15 press; 10. 12 by 18 press; 11. type stands. (At right) Drafting department

The aims and emphasis of the courses at Manual are those generally recognized as industrial-arts aims, but vocational outcomes inure to many of those enrolled. Local industries absorb the graduates readily into jobs in the fields of the youths' major interests. Girls are also enrolled at present in drafting and printing.

At the opposite end of the city from Manual, Broad Ripple High School serves the needs of its community with a less extensive, but very excellent industrial-arts department. The three shop activities here were expanded into general area shops from a former general shop when this addition was built in 1949.

Additions are now under construction or planned, which will provide more adequate quarters or enlarged opportunities at three other high schools. The Harry E. Wood School, established in the building vacated by Emmerich Manual Training High School, is undergoing remodeling to serve its community better.

All high schools in Indianapolis are comprehensive high schools. Industrial arts is a part of the curriculum of each one, but with variations due to building facilities. Industrial education with vocational aims is offered primarily at Arsenal Technical High School and Crispus Attucks High School, but in keeping with the cardinal



Industrial Arts Department, Broad Ripple High School, Indianapolis, Ind.

(At left) Drafting room: 1. blueprint machine; 2. print dryer; 3. print dryer; 4. lavatories; 5. thirty-two drafting tables

(Right, top) Metal shop: 1. 7-in. shaper; 2. bench vise; 3. T. & C. grinder; 4. thirteen engine lathes; 5. 12-in. shaper; 6. milling machine; 7. grinders; 8. soldering bench; 9. stake bench; 10. squaring shear; 11. box brake; 12. tool stand; 13 spot welder; 14. four lathes; 15. bench

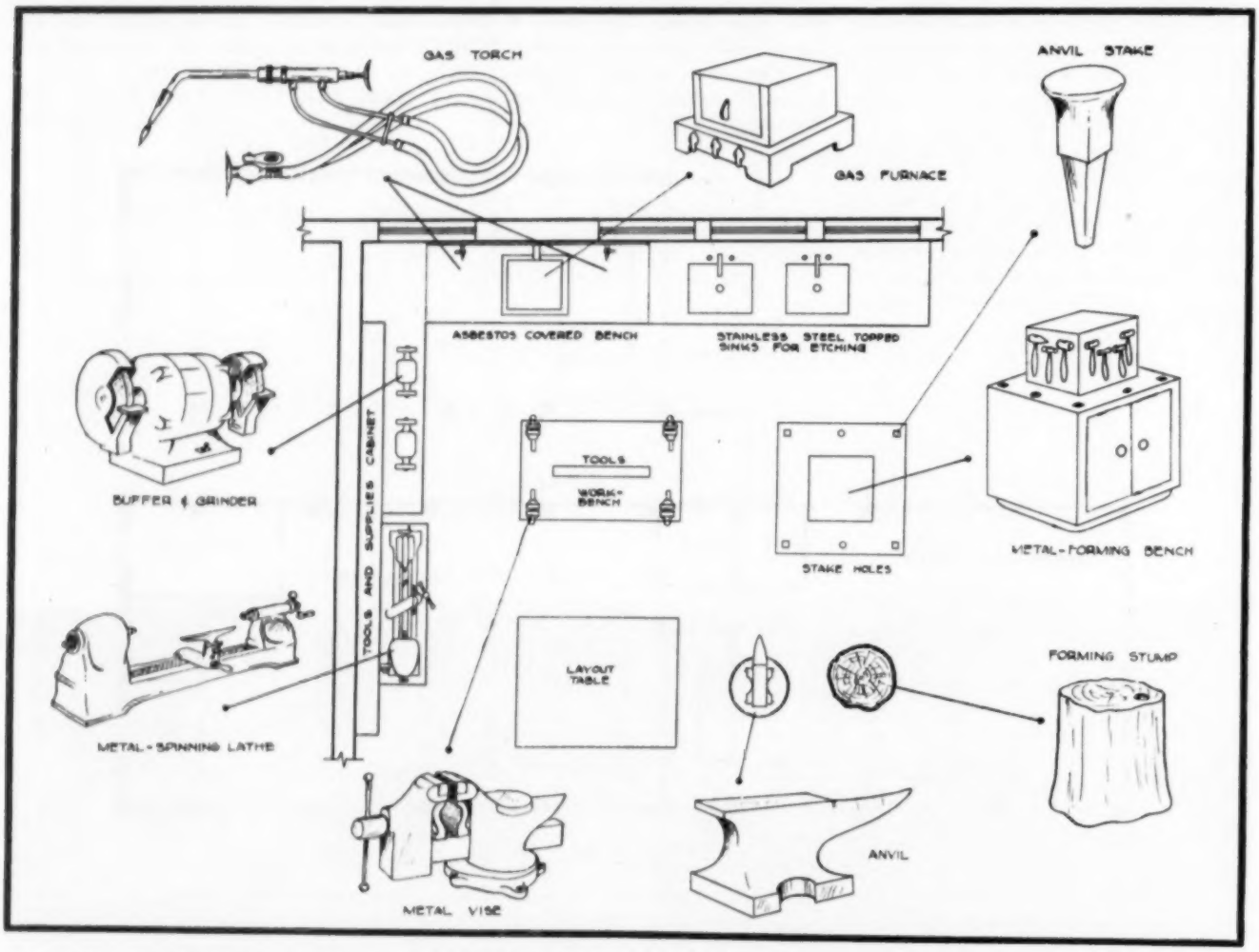
(Right, lower) Woodshop: 1. lavatories; 2. eighteen benches; 3. 10-in. table saw; 4. shaper; 5. saw and jointer; 6. band saw; 7. mortiser; 8. jig saw; 9. grinder; 10. drill press; 11. six wood lathes

Machine shop and print shop at the Emmerich Manual Training High School, Indianapolis, Ind.

principles of secondary education, vocational interests are encouraged in all high schools.

Indianapolis is fortunate in having excellent community support for industrial education, and a school administration which understands and supports industrial education as an important part of education in a democracy.

Petroleum is used in many ways to aid the U. S. motorist. In Ohio, unique methods were used to clear a highway after a blizzard. A petroleum-fueled crop-dusting plane became an "aerial snow plow." It spread crystallized salt on a highway and caused snow and ice to thaw. — *Petroleum Newsnotes.*



Planning the art-metal area in the general shop by Geo. A. Willoughby, Michigan State Normal College, Ypsilanti, Mich. Drawing by Donald Campbell

The New Riverdahl Elementary School

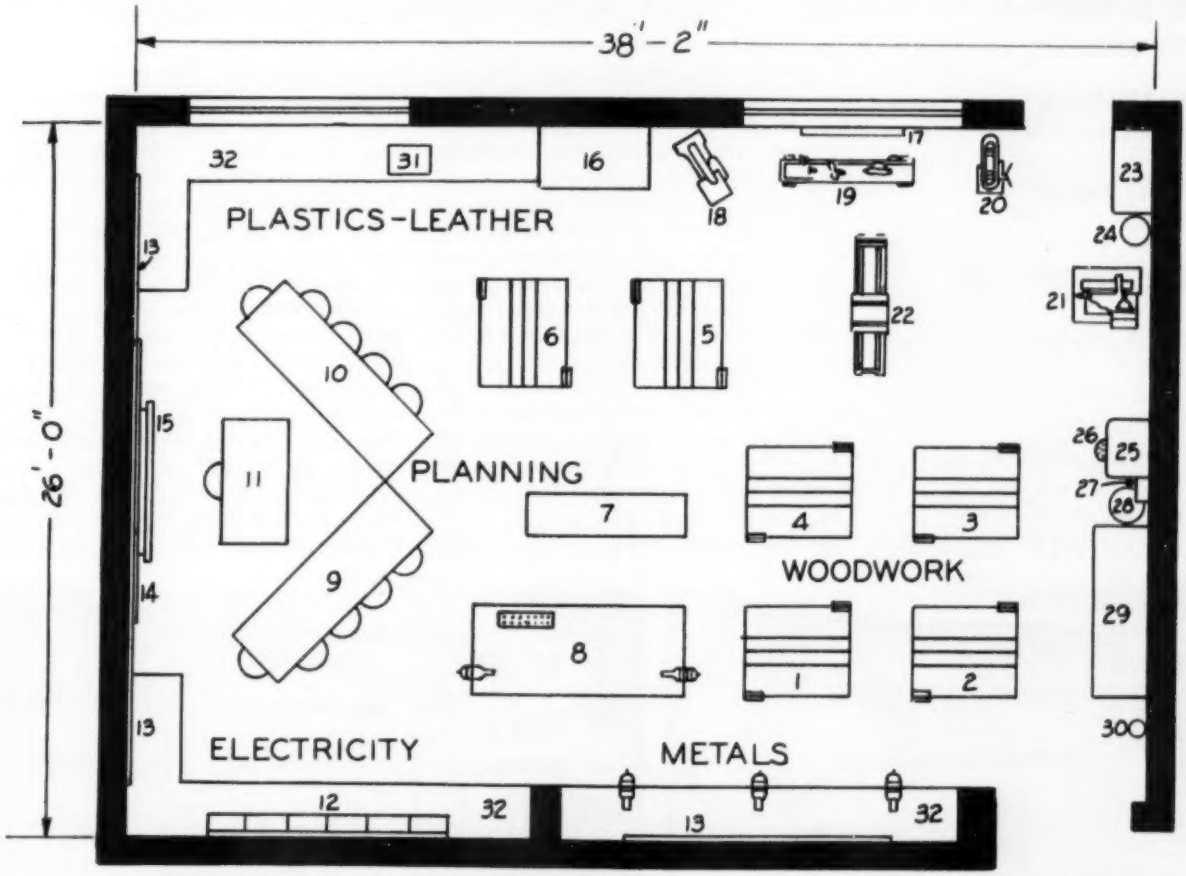
JOHN E. FORTIN
Director, Adult and Industrial Education
Rockford, Ill.

The new Riverdahl Elementary School was completed and ready for the first day of school on September 10, 1953. Plans were made to include an elementary industrial-arts program. The plans included a general shop setup.

The instructor, Anthony Manne, was secured for this new program by transferring him from Washington Junior High School to the Riverdahl School, and he helped to make the plans for this new shop.

The shop is equipped to cover units of work in metalworking, electricity, woodworking, crafts (including leatherwork and plastics), and planning. The classes in this shop usually range from 20 to 25 students — boys and girls in the fifth, sixth, seventh, and eighth grades. There are approximately 125 pupils enrolled in the industrial-arts program.

The size of the shop is 38 by 26 ft.; however, there is an adjoining room where all materials, lumber, and projects are stored. By having this arrangement every foot of the floor space in the shop area is used for instructional purposes. The ceiling of the shop has been acoustically treated. This shop is located in the basement and the general lighting is provided by fluorescent fixtures. The walls of the shop have been painted with pastel colors.



A general shop for the elementary industrial-arts program planned by Anthony L. Manne

Key to general shop floor plan: 1–6. woodworking benches; 7. Berkray sheet-metal unit; 8. sheet-metal stake bench; 9–10. planning tables; 11. teacher's desk; 12. electrical panels; 13. bulletin boards; 14. chalkboard (green); 15. visual aids screen; 16. tool cabinet; 17. lathe tools and shopsmith accessories; 18. jig saw; 19. wood-turning lathe; 20. drill press; 21. belt and disk sander; 22. shopsmith; 23. metal storage cabinet; 24. oily waste can; 25. sink; 26. drain; 27. dispenser (towels); 28. wastebasket; 29. finishing bench — storage below; 30. fire extinguisher; 31. portable oven; 32. built-in workbench with cupboards below

An interesting feature of this shop plan is that in the planning unit there are two folding library tables and when additional floor space is needed, these tables can be folded up and pushed up against the wall allowing for sufficient space for assembling student projects. Another desirable feature is that the tool panel is located in the center of the room. Tools are located on the doors as well as the back of this panel and allow for easy checking on the part of the instructor.

The instructor has used the pupil personnel system very effectively. The students are assigned various jobs on a rotating plan to assist with maintaining the shop.

This general shop layout may be helpful to schools with limited space but a desire to offer an enriched curriculum by adding an industrial-arts program.

Tool Panel Arrangements at Ball State Teachers College

HENRY A. LOATS
Associate Professor

BERNARD R. JOSIF
Associate Professor

LLOYD P. NELSON
Associate Professor

WILLARD A. ALLEN
Instructor

CHARLES E. SHOEMAKER
Instructor
Ball State Teachers College
Muncie, Ind.

Basic Planning of Tool Panels

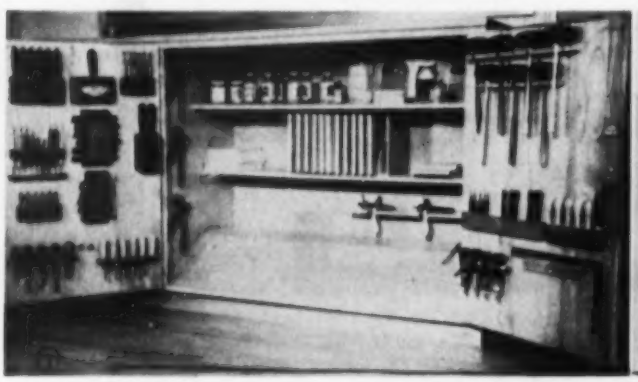
It is the belief that any area within the industrial-arts program will be made much more effective by a well-arranged method of storing and displaying the tools of industry necessary for a functional laboratory.

Before the actual design and construction of the tool cabinets can become a reality it is necessary to have the basic concepts of general industrial-arts education, the curriculum, general education objectives, and the purposes of the total integrated program well organized and carefully planned. This will include other aspects which are equally important such as philosophy, curriculum, function, design, care and maintenance, general appearance, success in housekeeping, discipline, safety, and numerous other situations which may be pertinent and unique to an individual's respective shop program.

The tool storage cabinets at Ball State are built to comply with the needs of the various laboratories. Plan specifications call for the specific size details as well as the materials for construction. The cabinets are made of birch with natural finish. There are framed bulletin boards secured to the outside of the doors so when the doors to the cabinets are closed, the bulletin board serves as a display for tool charts, instructions, safety factors, records, and other useful teaching aids.

The tool cabinets are located within the various laboratories nearest to the centralized work areas. The tools, representative of the activities in that immediate area, are arranged within the cabinets according to natural groupings so that they are easily accessible.

The problems of transfer of tools between laboratories is reduced to a minimum because each laboratory is adequately equipped with a wide variety of hand tools. If a tool is misplaced or appears in another shop it can be readily distinguished and returned to the proper laboratory because of a color code system used: general shop, blue; drafting, white; graphic arts, yellow; power and electricity, green; metals, red; and woods, orange. The placing of tools in their logically organized groups or sequence helps to keep the cabi-



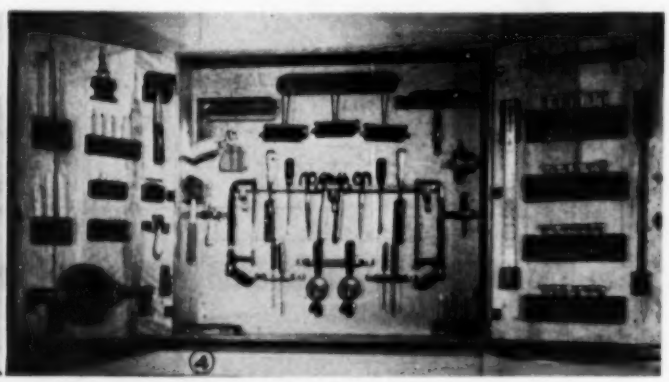


Fig. 1. Leather tools located beneath table height cabinet. Top may be used for display purposes or work station. Fig. 4 (at right) The wall tool panel in the graphic-arts area displays tools for four activities — bookbinding, silkscreen, wood engraving, and linoleum block

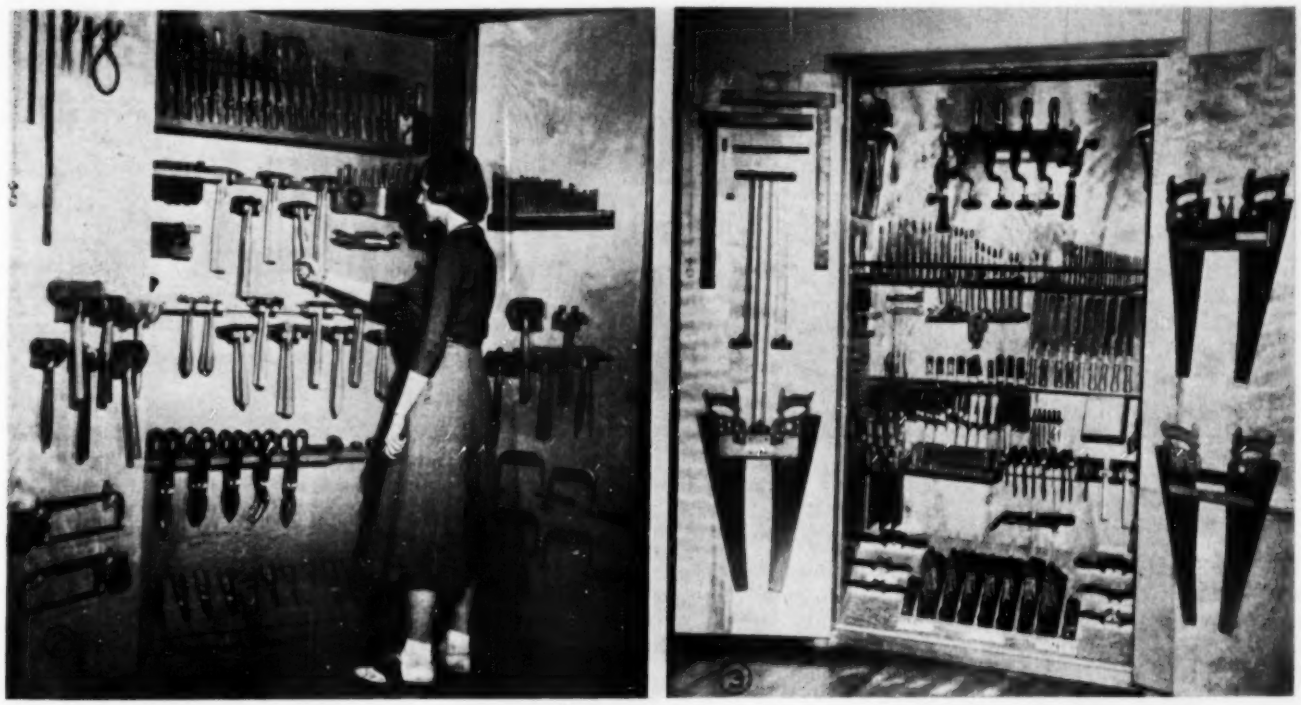


Fig. 2. A student in elementary teacher preparation is seen selecting tools from the metal tool panel in the general industrial-arts area. All students studying elementary education are required to take a course specially organized for their purposes. Fig. 3 (at right) The woodworking tool panel has been planned for a general shop and teachers preparing for elementary school teaching

net orderly. The toolholders and fixtures have been designed and constructed by the instructor who is responsible for a given area. Many of these fixtures present the combined thinking of the instructors, shop assistants, and students. Many hours of work have gone into the building of these fixtures but the reward comes in the realization that an orderly and adequately equipped tool cabinet is a necessity to good teaching. Lectures, demonstrations, and experiments can be performed directly in front of the cabinet using its contents as a learning situation. Student personnel organizations are more functional when an orderly cabinet is available for replacing tools after a period of work. Fixtures which have been built are not necessarily final. In many instances fixtures are remodeled, redesigned, or rearranged whenever the need arises and sufficient space remains in the cabinet to permit the addition of new tools. The students are encouraged to make suggestions to improve the layout of the panels.

The tool cabinets are in themselves display cases as their appearance presents a quality that is pleasing, neat, and attractive. All tool cabinets are equipped with lock and key so that they may be safely locked up at the end of the school day. However, all tool cabinets remain open for any industrial-arts student who wishes to do extra work during supervised periods.

Application of Tool Panels by Areas

Modern tool panel arrangements are of extreme importance to the well-rounded industrial-arts program at Ball State Teachers College. A description of the panel arrangements broken down into respective areas will give the reader a clear understanding of the use and purpose of the panel in that area.

General Industrial Arts

The leatherworking tools are contained in a cabinet as shown in Figure 1 and are about table height so that the top of the cabinet can be used for display purposes with a bulletin board mounted above. The tools are grouped as shown. Skiving knives, modeling tools, snap fasteners sets, and other special tools are placed together. There are also mallets and chisels on the right hand door as well as fids and sewing awls.

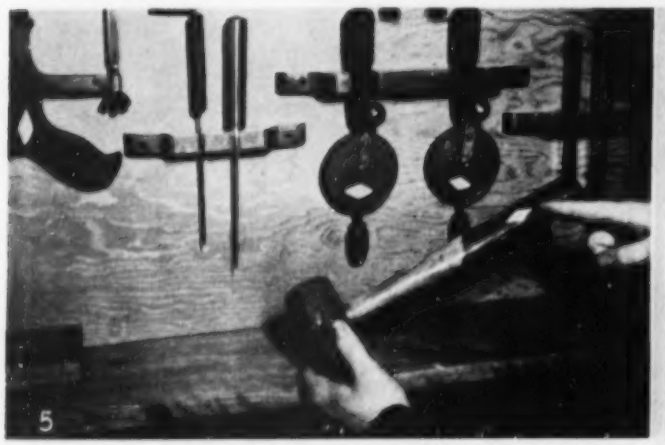
The shelves are used for storing leather finishing supplies as well as cutting boards. Softer boards for use with thonging chisels also are stored on these shelves. Revolving punches are stored at the sides of the cabinet on hooks. The cabinet has a slanting shelf at the bottom on which tool storage will be used at a later time. This surface helps to keep the cabinet clean and encourages students to replace tools in their respective place.

Metalworking Tools

The metalworking tools, pictured in Figure 2, are conveniently located in the general industrial-arts laboratory in the vicinity where most of the metals activity is conducted. It may be seen that there is ample room for future expansion. Tools have been grouped as much as possible. For example, the files are located at the top of the cabinet with a holder for each. The files seldom fall out of the file handle because they are stored so that the file bears down into the handle. Near the files to the right is a file card and wire brush for cleaning files.

Various forming hammers have been placed according to the work for which they are intended. Tools have been placed in pairs so that they are easy to obtain and replace. Tin snips are stored in pairs and the various kinds of pliers are located beneath. The plywood has been cut to the contour of the pliers and placed on the slanted surface at the bottom of the cabinet. The pliers are very easily replaced because the shape suggests the desired position. The slanted surface also helps to keep the cabinet clean since no tools can be piled up at the bottom of the cabinet. The saws are arranged on the doors as they are light in weight. A variety of mallets are also grouped. Layout tools and sets of drills are placed on the doors.

The woodworking tools pictured in



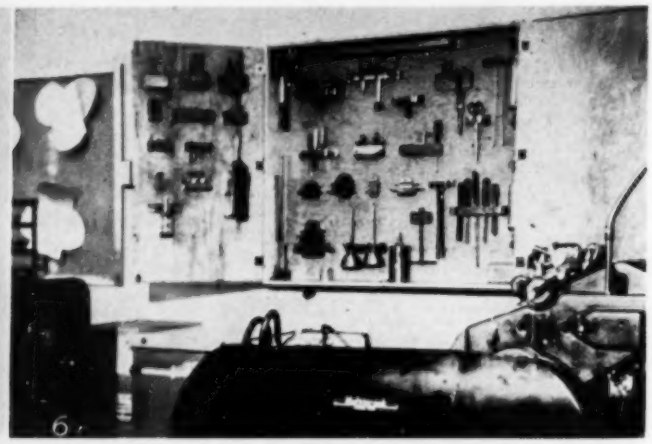


Fig. 5. The finger is directing your attention to the yellow colored diamond shape mark which indicates that the mallet belongs in the above cabinet and in the graphic-arts area. Fig. 6 (at right) The tools located in the wall cabinet in the pressroom area are marked by yellow solid circles. Observe the mounting of the oil can washer which has been soldered to the spout and fitted to a jig

Figure 3 have been selected for a general shop situation as well as for students in preparation for elementary school teaching. All tools are accessible and easily replaced because each tool has separately designed holders. Tools are grouped in such a manner that they are readily observed. The rules, squares, and saws have been placed on the doors since they are light in weight and do not interfere with the closing of the doors. As can be viewed, the long handled tools, such as mallets and hammers, hand braces, and hand drills have been placed near the top of the cabinet for easy reach.

All augers and bits are grouped in one long continuous holder and their sizes have been burned into the wooden holder. The slanted surfaces at the bottom retain the heavy planes so they can be easily and naturally positioned. The front of the cabinet is flush with the wall.

The doors of the cabinet may be closed at the end of the day to help keep out dirt and dust. An air hose may be used at times to clean the entire cabinet in a matter of seconds.

Graphic Arts

As previously mentioned, each shop has a basic color code so tools may be identified.

For example, in the area of graphic arts, yellow is the color code used to identify the tools used within the shop. The tools displayed in the cabinet shown in Figure 4 are used for bookbinding, silk screen, wood engraving, and linoleum block carving, and are marked diamond shape. A close-up of the *diamond shape* code, in Figure 5, gives a more detailed interpretation of the code system. The markings are usually located on a contrasting surface so that they can be distinguished readily. The markings should be placed on a portion of the tools that will not show much wear.

The tools shown in Figure 6 are located

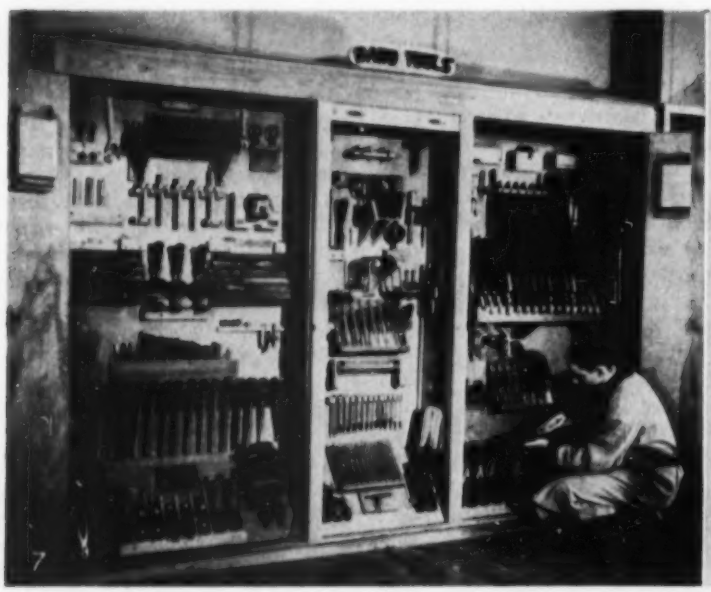


Fig. 7. The woodworking area master tool panel has three divisions with a wide selection of tools that can provide working efficiency and facilitates ease in tool accounting. Fig. 10 (at right) Bench tool panel in metal shop is built flush to the wall and stands seven feet high and six feet wide with the door surface used for tool mounting. This surface area has approximately one hundred square feet used for this purpose. Observe the three methods of mounting micrometers

in the wall cabinet adjacent to the platen, cylinder, and offset presses. These tools are marked with a yellow circle. Perhaps it would be well to suggest that markings be selected that can be painted solid rather than outlined as they are recognized easier and can be observed from a greater distance. This is a departure from the method of painting the tool, handle, or surface area a solid color.

All the wall cabinets in this area are suspended from the walls and secured by six metal screws.

General Woodworking

The main tool storage space of the woodworking laboratory is located in one master panel and in close proximity to eight (four station) woodworking benches. The central location of the panel makes it accessible to the students using woodworking machines which means less traffic to and from the panel.

The tool panel is of the enclosed type but the width, height, and depth is such that several students may secure tools at one time without confusion. Figure 7 shows the three divisions to the panel so that any section may be closed and locked. The panel was planned for a wide distribution of tools with allowances for flexibility. The inside of the large doors will be used for future addition of new tools.

The center section as enlarged in Figure 8 was designed to hold a variety of the more common woodworking tools which means that sufficient tools would be available in this section if necessary to close and lock the other sections. Tool spacing is such that other tools may be added as planned. This center arrangement was made possible by the use of the sectional-sliding door shown partly closed in Figure 9.

The toolholders were designed and constructed for durability as well as facilitating the natural way of grasping a tool by the handle. Concern for safety and care for cutting edges is evident by covering sharp edges (note wood chisels, knives, etc.) or turning of sharp edges to the wall (saws, planes, scrapers). Tools can be

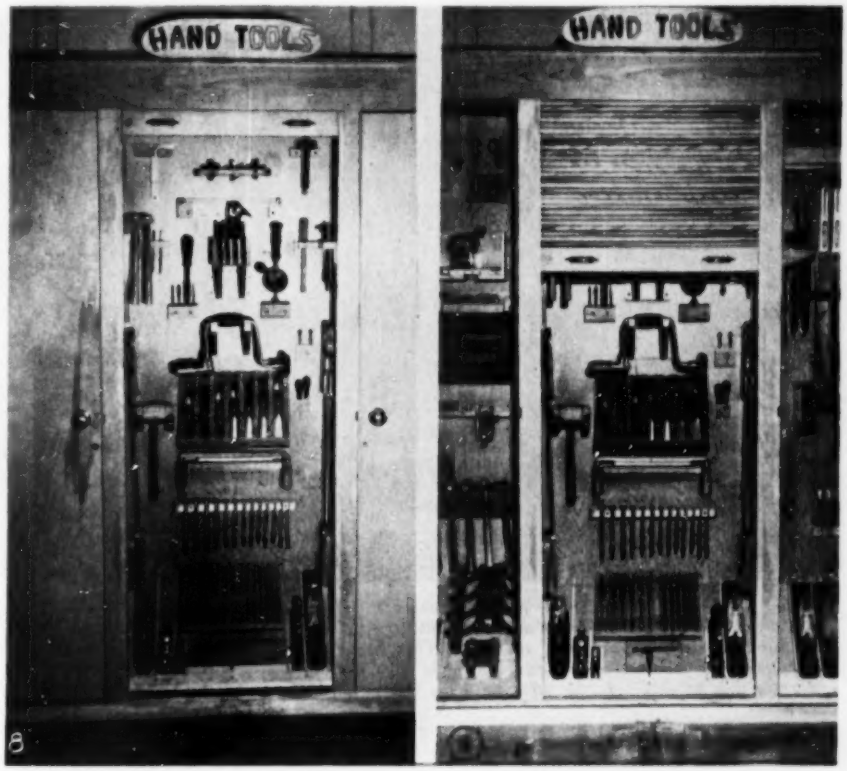
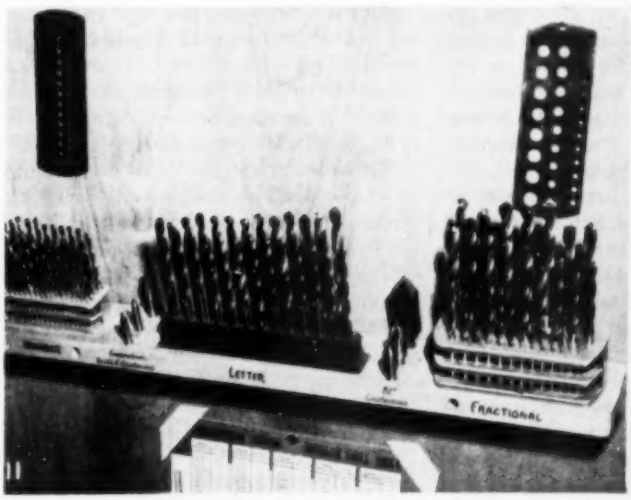


Fig. 8. A center section offers a selected group of common woodworking tools. A large open space in front of the cabinet makes for an ideal demonstration area. Fig. 9 (at right) A sectional sliding door makes the center section a cabinet within the master panel. The door is partially open to illustrate its purpose



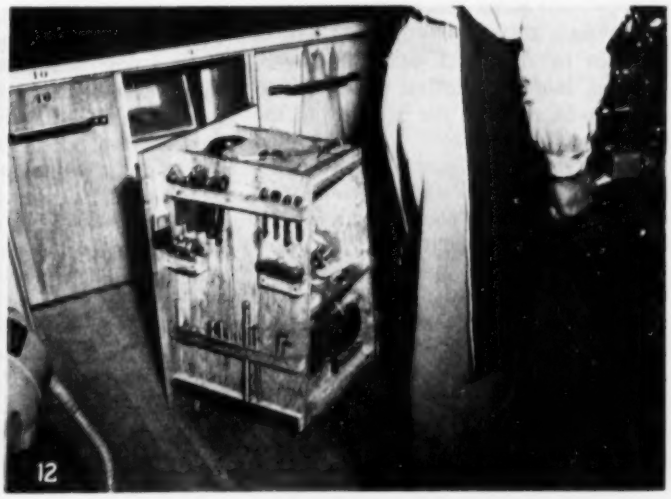


Fig. 11. A close-up view of the unique method of mounting the three drill sets on a permanently mounted angular block using standard twist drill holder. Other tools as scribers, taps, dies, and punches can be mounted by the same technique. Fig. 12 (at right) The machine tool storage card is portable. A student is at work on a lathe with cart and tools necessary for the operation of that machine. Additional carts are stored underneath the workbench in the background. The stall is marked on the side of the bench and a corresponding number on the cart, also the machine for which the tools are used

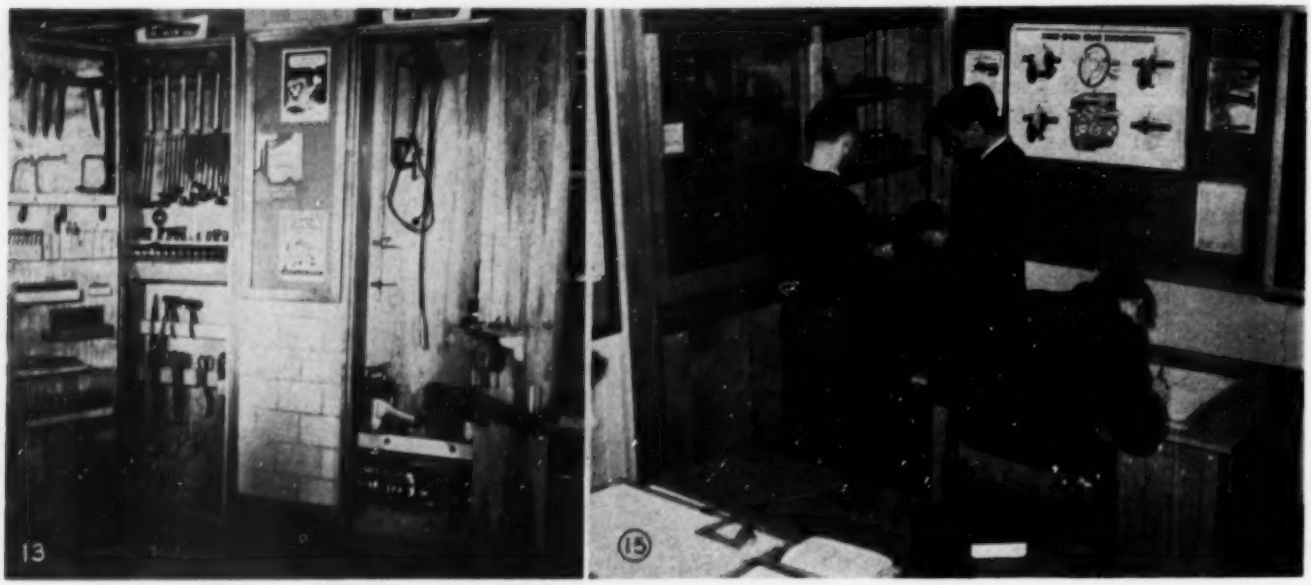


Fig. 13. The art and sheet-metal panel, and portable tool panel have been cleverly planned beside a construction post. This space would have been normally wasted but serves the purpose as the art metal bench is directly in front of the panel. Notice the use of the post as a bulletin board. Figure 15 (at right) Students can be seen examining machine parts from the built-in wall cabinets adjoining the two drafting areas. The materials within the cabinet are obtainable from both drafting areas. The specially designed drafting desk has six storage cabinets, of which three can be observed. The other three are located on the left side of the desk and constructed across the front of the bench beneath the table top

withdrawn from the holders with ease and without fear of striking a sharp tool above. Every space was planned even to the extent of using the sides of each division. The one master tool panel has the advantage of making a tool check relatively easy at the end of each work period. Few tools are misplaced as a result of having student personnel make a tool check. The ultimate objective of working efficiently is gained by placing tools as close to the work areas or machine as possible.

Metalworking

The main tool storage for this area is provided by three wall tool panels with swinging doors. The largest panel, labeled bench tools, provides the majority of the tools used for benchwork, measuring, and layout as shown in Figure 10. This cabinet is built flush with the wall. Wherever possible a balanced tool panel arrangement is used. Mounting methods vary due to attempts to find the best methods. One example of this is in the mounting of micrometers. Close observation will reveal three different approaches as follows: (1) grouped horizontal micrometer mounting, (2) separate horizontal micrometer mounting, and (3) grouped micrometer mounting at an angle to wall. All are functional with the third method mentioned being the most preferred at this time.

As illustrated in Figure 11, the three drill sets, fractional, letter, and number, plus combination drill and countersinks, and 82 deg. countersinks are mounted permanently on an angular block using standard twist drill holders. This method has eliminated the problem of mixing or misplacing drills because of being easily checked at the closing of each class period. This angular type of mounting has also proved functional for the mounting of such items as scribers, taps, dies, and punches.

Tools and equipment for each machine are located in individual tool carts which are stored underneath workbenches when not in use.[1] The cart is moved to the machine when in use, as illustrated in Figure 12. This arrangement has proved to be a time saving factor as well as organizational because the equipment needed for the specific machine is found in one location thus saving the student considerable time in beginning his work.

The other wall tool panels consist of two cabinets built in on either side of a construction post as pictured in Figure 13. A convenient bulletin board is mounted on the wall between the tool cabinets. The complete interior of the panels plus the doors are used for tool mounting. The portable power tool panel is in the process of being developed and represents an approach to group this type of equipment.

Open type tool panels are numerous throughout the metals area for buffing, foundry, milling cutter storage, soldering tools and supplies. Sheet-metal stake storage is presented in Figure 14. Precision inspection equipment with the exception of the Rockwell hardness tester is located on one bench reserved for this purpose.

[1]Voho, Lewis W., "Tool Accessory Cart Useful in Metal Shops," *School Shop*, Oct., 1951, p. 24.

Drafting

The drafting facilities consist of two adjoining rooms separated by steel partitions with glass panels that are movable if desired. The one drafting room is for general drafting and the other is more specialized for architectural, design, and machine drafting.

Students' drafting tools and equipment are located in assigned cabinets built into the drafting tables. The problem of tool storage is cut to a minimum. A key to a cabinet is assigned to each student who is responsible for the tools and equipment.

The drafting wall cabinet is divided into two main parts as observed in Figure 15. The top portion has sliding glass doors and lower section has wood panel doors.

The interesting feature of this type of construction is the cabinet being part of the wall of the adjoining rooms. They are so constructed that the tools, materials, equipment, and visual aids stored in the cabinet are available in the two drafting areas and can be used interchangeably.

Transportation and Electricity

Two tool cabinets, purchased from a nationally known manufacturing company, have been utilized in this area. The one, illustrated in Figure 16, is used for dis-

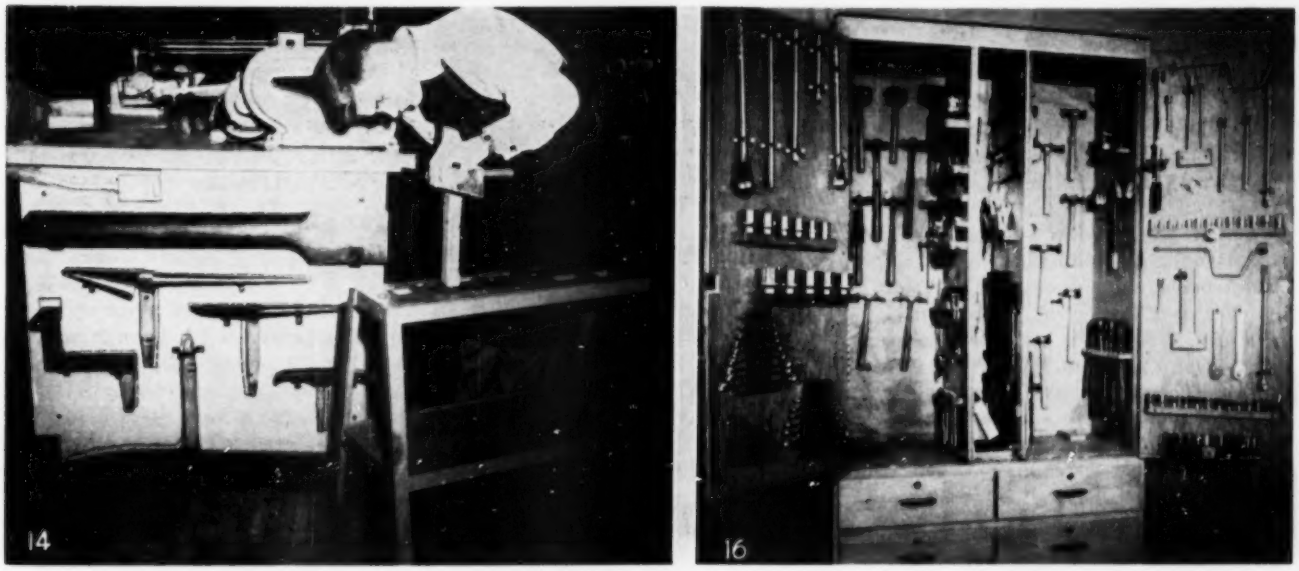


Fig. 14. A student is pictured working beside the sheet-metal stake storage panel. This is one example of several open-type tool panel arrangements located in the metals area. Fig. 16 (at right) Illustrated is the special tool panel used in the automotive phase of the transportation and electricity areas. The drawers in the cabinet are used to store cumbersome equipment and the two center panels in the cabinet pivot freely about a vertical axis and are easily removed

play and storage of many standard and special tools used in the automotive phase of the transportation course. The other cabinet, similar in design to the one shown, is located on the opposite side of the shop, making tools and equipment necessary in the construction of electrical projects readily available to the students in that area.

One noteworthy feature of these cabinets is the ample drawer space for equipment too cumbersome to hang on a panel. The four drawers are fairly deep and long, and satisfactorily contain such things as drop cords, air hoses, special pullers, certain electrical test equipment, and other like items.

Much of the space in the upper part of the cabinet, which otherwise would be wasted, is put to good use by the two additional panels which appear in the center of the cabinet and pivot freely about vertical axes. Tools, therefore, are hung on both sides of each movable panel. These two panels may be easily removed from the cabinet, making the original tool mounting job easier.

The door backs are reinforced with one-half inch plywood in order that this additional area might be used. The reader's attention is directed to the visible means which have been used to prevent the tools on the back of the doors from *flopping* or falling off when the doors are opened and closed.

Because of the depth of the cabinet, there is always a shadow cast on most of the tools. This is a feature which might be eliminated by carefully placing fluorescent tubes within the cabinet.

Special Storage Rooms

In addition to the tool storage facilities in the areas, all major laboratories have individual storage rooms adjoining the area. These rooms accommodate reserve supplies, parts, additional cabinets, tools, benches, equipment, and special machinery. An example of additional machinery is as follows: power hack saw, metals; automatic saw filer, woods; power paper cutter, graphic arts; automotive testing equipment, transportation and electricity; and blueprinter, drafting.

Summary

The purpose of the article and photographs is to illustrate to the reader some of the techniques that may be employed in tool panel arrangements. It is recognized by the authors that there are numerous methods and techniques of displaying tools and equipment.

The matter that is most important for teacher education purposes is a laboratory which possesses a wholesome environmental setting, together with proper educational instructions, leadership, and training. Guidance and professional approach will develop in this setting and the end product will be a more effective shop teacher. This is important to all shop teachers because we realize that only through group co-operation and the exchanging of views and ideas, can the standards of our profession be raised.

Conclusion

In concluding, it is recognized that it may be difficult for the interested reader to grasp in its entirety the organizational pattern and location within the various areas of the tool panel arrangement as represented at Ball State Teachers College.

It is suggested the article "New Industrial Arts Section at Ball State Teachers College"[2] and the Ball State Industrial Arts Department 1953 Brochure[3] which illustrates the laboratory activities in the various areas, will serve to further structure the situation and assist the reader in gaining further understanding and insight into this problem of tool panel arrangement.

Acknowledgments

This article embodies the combined thinking of the laboratory instructors at Ball State Teachers College in the areas of general industrial arts, graphic arts, woods, metals, drafting, and transportation and electricity; and has been compiled and edited by Bernard R. Josif, assistant professor of industrial arts, at the request of the group.

Credit is given to the following men, without whose help it would have been virtually impossible to arrive at the thoughts conveyed in this writing: Mem-

[2]Schmidt, Fred J., Jr., "New Industrial Arts Section at Ball State Teachers College," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Vol. 41, Mar. 1952, pp. 63–71.

[3]Industrial Arts Department, "Looking to the Future," Ball State Teachers College, Muncie, Ind., 1953, Publication No. 142, 40 pp.

bers of the staff, Dr. Fred J. Schmidt, Jr., head; and Robert McGinnis, assistant professor of industrial arts and in charge of industrial arts at the Burris Laboratory School; and former members of the department, Dr. Oliver C. Bumb, administrative assistant to the president, Ball State Teachers College; Dr. Alan R. Pawelek, chairman, Department of Industrial Arts, Western Washington College, Bellingham, Wash.; and Lewis W. Yoho, director of industrial arts and vocational education, South Bend Public Schools, South Bend, Ind.; and Carl D. Richards, General Motors Corporation, Delco Battery Operations, Delco Remy Division, Muncie, Ind.

The photographs which accompany this write-up were taken by Bernard R. Josif, graphic arts area, and assisted by Jack Ward and Jackie Cox, students, Ball State Teachers College.

Central Tool Crib Versus Individual Tool Panels

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Teachers College, University of Cincinnati
Cincinnati, Ohio

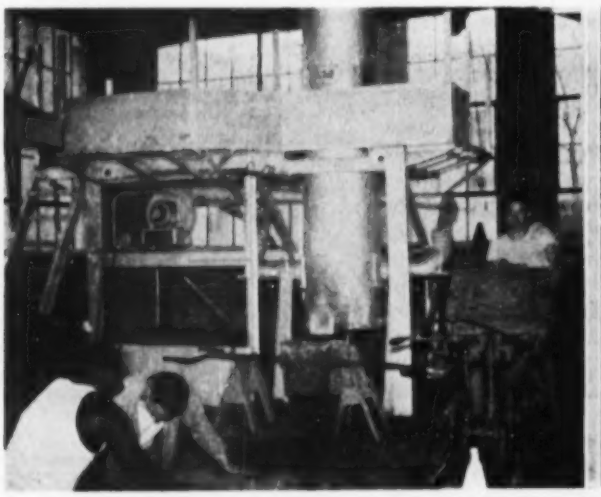
Instruction in foundry work is part of Springfield's vocational trade and industrial education program under the direction of Herman R. Seaman, supervisor, and Robert E. Crabbe, instructor.

The foundry is located in a separate brick building adjacent to the regular senior high school, Springfield, Ohio, with floor space of approximately 30 by 60 feet. It contains the following equipment: 18-inch cupola (Fig. 1); jib designed by students; two-ton electric hoist; jolt roll-over; jolt squeezer; gas crucible for non-ferrous metals; electric riddle; electrically operated tumbling barrel; gas core oven; sand blast; pedestal grinder; two dozen assorted floor flasks; forty snap flasks of various sizes; and the usual number of hand tools required for foundry work. Instruction is provided in the use of both green and dry sand.

The Situation

How to prevent students from *walking off* with small tools in their pockets was a problem that confronted the new foundry instructor. Not because the boys were dishonest, but largely due to the fact that many of the hand tools used in foundry instruction were rather small and easily overlooked in the rush of cleaning up.

At the time when this problem arose at our shop, the foundry training program consisted of a vocational trade and industrial class of approximately 15 junior and senior boys and two prevocational tenth-grade classes of about 20 students each. The vocational students remained in the foundry for three continuous hours, while the two prevocational groups were in the shop approximately half that time. The vocational boys, being familiar with the original plan of operation, gave little or no



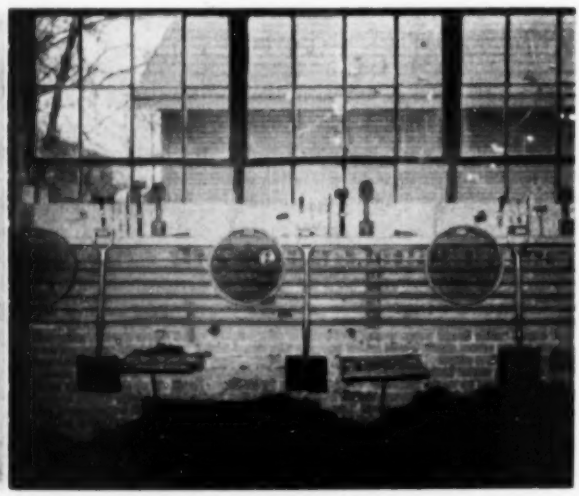


Fig. 1. 18-in. cupola, and Fig. 2. (right) tool panels near the working stations

trouble as they were used to the organization and could be depended upon to return tools and equipment promptly at the end of the shop period. The limited size of the class was also a factor since fewer tools were used and the tool crib attendant could check them in quickly, thus enabling the instructor to O.K. the tool crib promptly and excuse the boys to wash up and change clothes in time for their next class.

With the larger enrollment in the prevocational classes however, difficulties were encountered with this system of checking. This was due partly to confusion at clean-up time and partly to the larger number of tools checked out. The result was that invariably some of the small tools were missing or overlooked. Thus over a period of time the stock of hand tools was rapidly becoming depleted, a demoralizing situation to both instructor and students.

Contributing Factors

In general, two main factors operated to bring about the problem, one being the design of the foundry floor plan, and the other the disorder that resulted when a large number of students attempted to get tools at the beginning of the period or to turn them in at the end. The tool crib was well located in the center on one side of the foundry, but being of brick construction with no windows, it obstructed the instructor's view if he happened to be at one end of the shop. In addition, a centrally located storage space and smoke stack blocked the view on the opposite side of the foundry. Minor contributing factors were comparable to those that are found in the average school shop class at clean-up time such as, demands of students for immediate service at the tool crib window, carelessness in cleaning or counting tools checked out, borrowing other students' tools and failing to return them, piling tools on the tool crib window shelf and leaving without waiting to see that proper credit was given, bluffing and arguing with instructor and other students, maintaining that tools were turned in when they were not, blaming others for tool shortages, etc. Some students naturally took advantage of the situation when the instructor was in the opposite end of the foundry, to borrow other students' tools when they were not looking, turn in tools before the regular clean-up time, hide in secluded spots, etc.

Handling the Problem

Through the co-operative efforts of the foundry instructor, local supervisor and teacher trainer, the problem was handled as a unit in the general program of vocational teacher improvement. After analyzing the situation and considering the possibilities of checking tools by other methods, it was decided to try individual panels at each work station. Some opposition was expressed to this idea as it was thought that leaving tools out in the open was a standing invitation to students to appropriate tools for their own use. However it was agreed to give the plan a trial. A check was made on the additional equipment needed to provide the required tools for a minimum of 20 work stations. The tools were purchased and a sufficient number of individual tool panels designed and constructed through the co-operation of the instructors and students in the school's wood and pattern shops. Two by six shelving was placed on window ledges at the back of which were attached individual tool panels at appropriate intervals. Tools were laid out on the panels and holders made for them. (See Figure 2.) Brackets for holding such tools as sieves and shovels were designed in the related technology classroom and then cast in the foundry; an excellent way of promoting student interest. Figure 3 shows that a certain order of placing tools was developed which greatly facilitates checking on the part of the general foreman or instructor. A few special hand tools, and other pieces of equipment that were seldom used were left in the tool crib and checked out by students as needed.

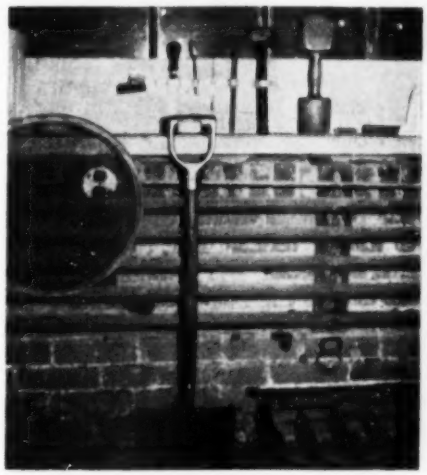


Fig. 3. Tool panel

Reorganizing the floor space so as to provide a sufficient number of individual work stations necessitated the relocation of some of the heavier machines as well as sand piles. These changes in most cases actually resulted in greater efficiency and student interest rather than less. It might be mentioned that the instructor discussed the proposed changes with the students and asked for their comments and suggestions. As is usually the case, the better students were already aware of the drawbacks of the old system and were very helpful not only in suggesting ideas but in putting the new plan in practical use at the time the change-over was made. While the change was being made, the instructor made a sustained effort to *sell* the students in all classes on the advantages that could be expected with the new system; how more work could be accomplished with no interference from others and how the quality of work could be improved. Plans were also developed co-operatively for the clean-up procedure, time for starting and quitting work; method of checking tool panels, location of heavy equipment and sand piles; disposition of excess sand, storage of flasks, etc.

Results Obtained

After several months of use the individual tool panel system has given most gratifying results. Many of the anticipated difficulties did not develop at all and the attitude and morale of both instructor and students have been raised immensely. Instead of the usual milling about, pushing, and shouting that formerly took place at the tool crib window at the beginning of a period, comparatively quiet conditions prevail. Students *fan out* to their work stations and start their assigned tasks as soon as they enter the foundry. In fact at one time the writer entered the foundry a few minutes prior to the opening of the period, before the instructor had arrived from his previous class, and every member of the class was busy working at his own station and paying attention to no one. Mr. Crabbe, instructor, stated that this was a common occurrence since the change was made; that a much more businesslike atmosphere prevails and that the attitude of all students has been improved immeasurably.

It should be mentioned that a personnel system was established as an added aid in the reorganization of the tool checking system, hence each class now has several foremen who are charged with definite responsibilities. These assignments are rotated among the students of each class and all foremen are *working foremen* which means that they are assigned jobs to do in addition to their foremanship duties. Hence it will be seen that no one is standing around doing nothing. No doubt Mr. Crabbe exerted a wide influence in the satisfactory operation of the new plan. Although a man of rather small stature, he

tolerates no foolishness, a fact soon learned by the students. While he controls with a firm hand he is friendly, well liked, and highly respected by the students. His ten years' experience in industry has given him a background which adds greatly to the interest manifested by the pupils when he shows them how to make castings that they were told could not be done in a school foundry.

Individual tool panels at work stations have therefore eliminated many of the problems that arose in conjunction with the central tool crib in the foundry at Springfield. Students have welcomed the responsibility and independence connected with taking care of their own tools and work stations. They now have more liberty. They can start work as soon as they enter the foundry, and clean-up time is orderly and relatively quiet. Tool checking is quickly and effectively done by the general foreman or instructor by merely walking around the shop and glancing at the tool panels. Loss of tools has practically been eliminated. In fact since the change was made one small tool was reported missing at the end of one period and this was returned a day or two later. The entire foundry has an entirely different atmosphere, more businesslike with a resulting increase in student and instructor morale. As a matter of fact students have become so much more interested that they recently have been brightening up the inside of the foundry by painting the walls, so as to prove that a foundry doesn't necessarily have to be the dark depressing school shop that it is often pointed out to be.

Practical Use of Models for Shop Planning

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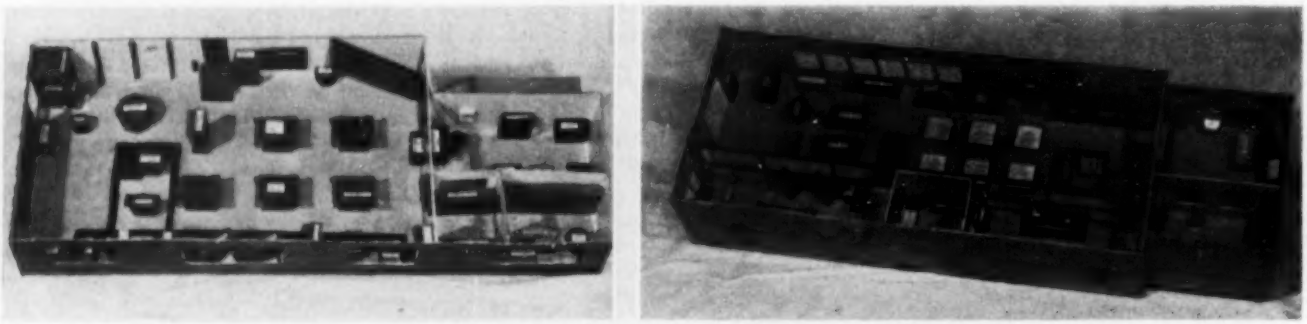
Iowa State College
Ames, Iowa
and
DURWIN HANSON
Assistant Professor
Industrial Training
Iowa State College
Ames, Iowa

The increasing interest in industrial-arts education has brought about a need for building new shops or the remodeling of present facilities. This trend has made it imperative that the shop teacher have a good, sound background in the principles of shop planning.

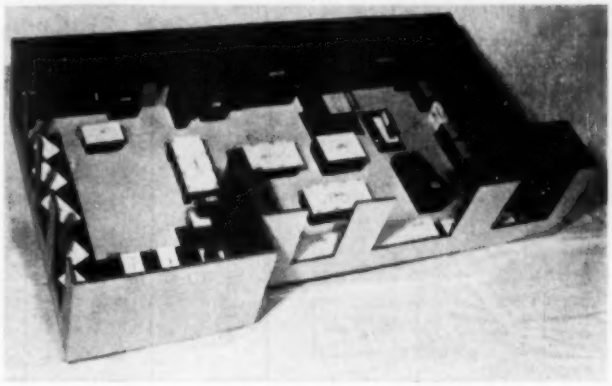
The shop planning course in the industrial-education curriculum at Iowa State College, Ames, Iowa, serves a twofold purpose in training students the principles of shop planning and the solving of practical problems in school-shop planning. In studying the principles of shop planning, the students visit a number of school shops and discuss planning problems with the local shop teacher. To provide practice in the solving of problems, the students are given an actual shop planning request. These requests are obtained from communities interested in revising their present plan or the addition of shopwork to their school program. Usually, the class has four or more such requests, and to facilitate working out the shop problems, the class is formed into committees, each committee undertaking a given problem.

The respective committees visit the school officials, obtain information as to type of program desired, number of teachers to be used, finances available, and any other information which may assist in the planning of a satisfactory shop for present and future demands. The committees then outline the suggested shop course or courses, draw the detail floor plans and



School shop plan for Madrid High School, Madrid, Iowa, and the school shop plan for Perry High School, Perry, Iowa

necessary elevations, and itemize the supplies, tools, and equipment needed. In addition, the above information is supplemented with a scale model in color code and with safety zones of the designed shop plan. When completed, the committees present their plan and program to the entire class for discussion and recommendations. When all the pros and cons are weighed by each committee, the necessary changes in the plans are made. The final step is the presentation of the plans and model to the interested school officials or shop teacher. The included photographs are of shop models planned for Madrid High School, Perry High School, and Ames Central Junior High School.



School shop plan for Ames Central Junior High School, Ames, Iowa

Toolholders—Panel or Crib

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University of Idaho
Moscow, Idaho

A great deal of time and space in our professional books and magazines have been devoted to the advantages and disadvantages of tool cribs, cabinets, and panels. But, little or nothing can be found in the way of drawings for each and every individual toolholder to expedite the efficiency of school-shop instruction.

It is practically an accepted fact, that a boy standing at a window checking out tools is a waste of his time; that a misplaced tool is a loss of both pupil and teacher time; that every tool should have a definite, as well as a conspicuous place, be it in the toolroom, crib, or on the tool panel. Therefore, there can be little doubt that well-designed toolholders are a valuable aid and the drawings of such holders are very helpful.

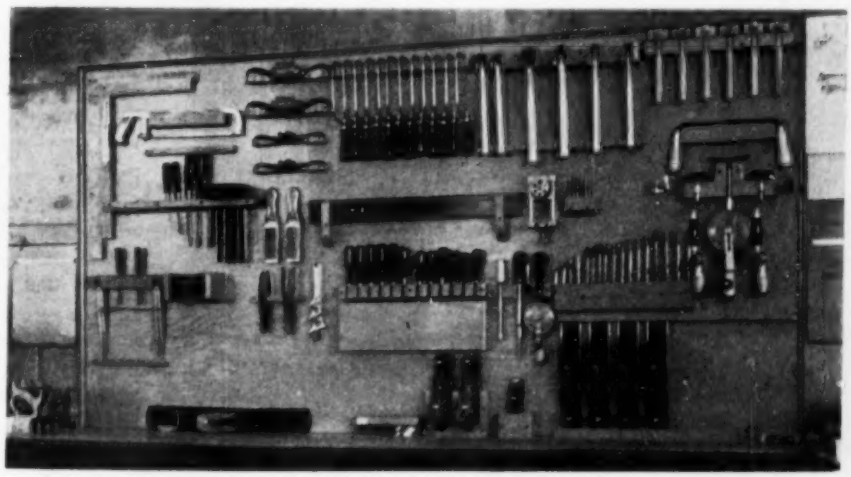
One may be painstaking in the planning, the arrangement of, and the painting of all toolholders; yet be amiss as far as efficiency, safety, and appearance are concerned.

With standardization of practically every common hand tool or piece of equipment manufactured, no shop instructor need be too much perturbed about any of the holders made today not fitting the tools which might need replacing at some later date.

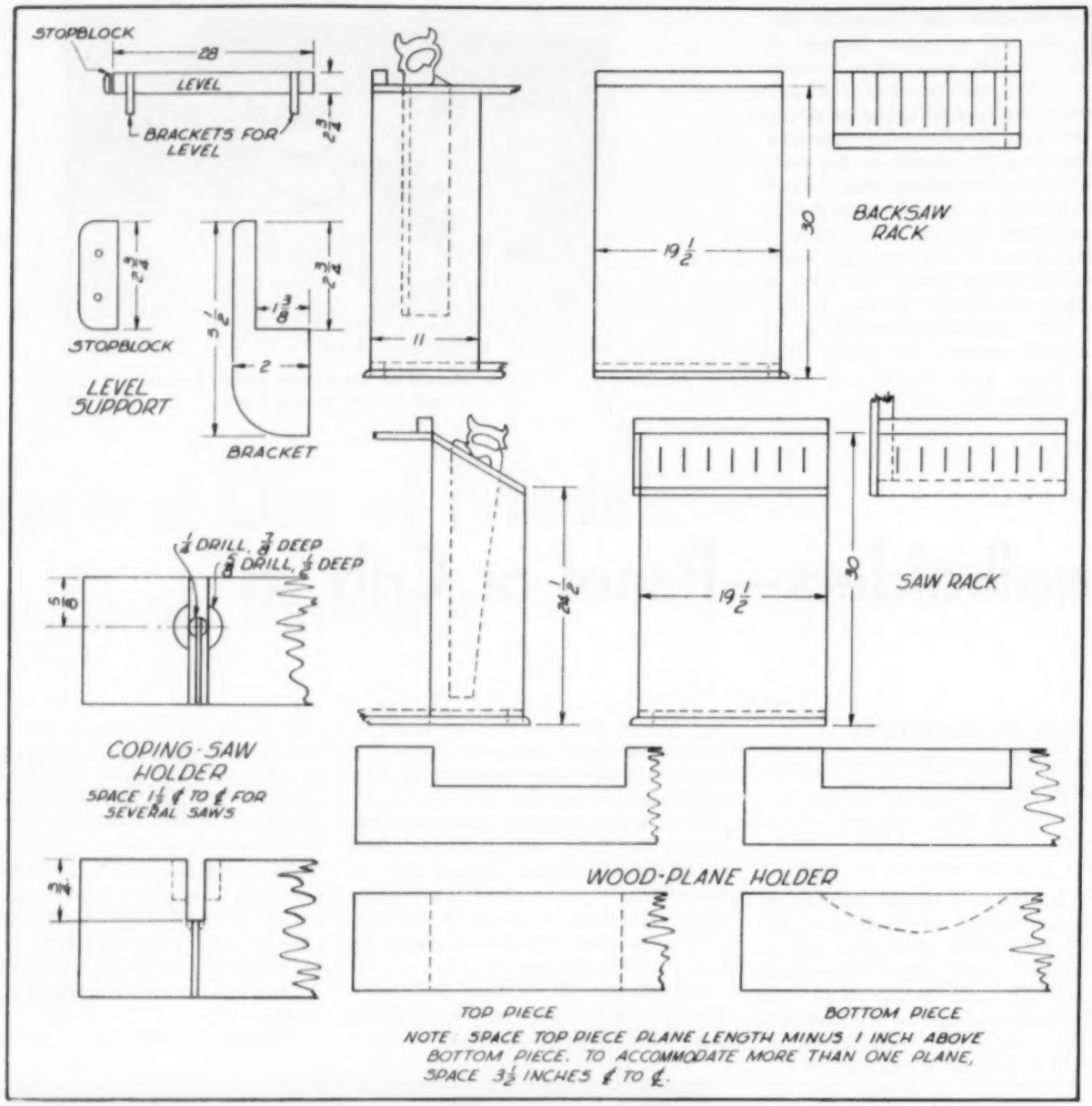
To plan and organize a modern department is one thing; but to set up a shop and at the same time attempt to carry on classes can be rather complicated. Using senior students of a class in *Organization and Administration* seems to be one of the most practical solutions.

After laying out all hand tools on a sheet of 4 by 8-ft. plywood, the group was given a fair idea of the amount of space allotted and required for each toolholder. Each student then chose and designed one of the toolholders shown in the illustrations. The main source of information was obtained from articles and pictures in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine. After considerable time and study a wooden pattern was roughly cut out of each holder. This was done for criticism and group approval. In some cases alterations were made to correct objections and to meet the approval of the group.

Wherever possible, all of the holders



Tool panel for woodworking shop



Details of various toolholders

were designed to accommodate one particular tool only.

In order that all tools be so arranged on the panel as to promote efficiency, convenience, and yet maintain all principles of safety, the following factors were considered:

1. Primary considerations — arrange holders so that the general appearance would be neat and attractive, yet convenient and safe.

2. Group like tools together — thus planes of all sizes were grouped in one area on the panel. This speeds up the returning of tools to the panel.

3. Locate those tools most frequently used and the heavier ones in the more accessible areas on the panel. Smaller and lighter weight ones should be grouped together and arranged higher on the panel.

4. Conserve space on the panel but do not crowd.

5. Locate all tools on the panel so that in removing there can be no element of danger to students. There should be no twisting or pulling of the tool to remove it from its holder.

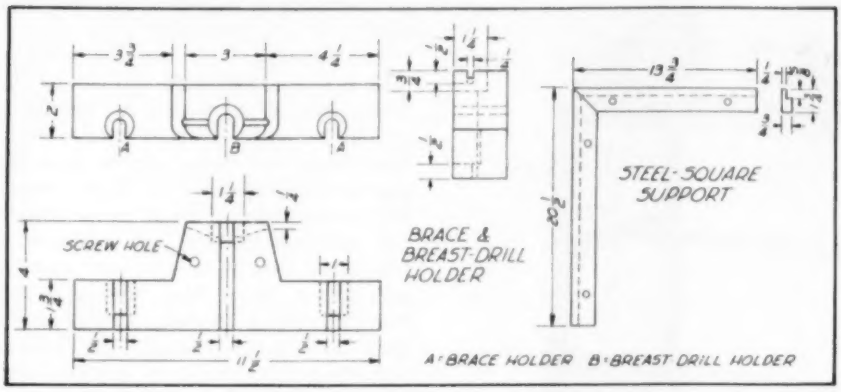
6. Cutting edges and sharp pointed instruments must be protected to prevent damage to student and tool.

7. Repair each broken tool immediately.

8. Allow no one to work in the shop unless enrolled in class. This creates a feeling of pride in the students that they are more or less a select group and are assuming responsibility for the care and use of all tools and equipment in the shop.

9. Keep all tools marked for identification to discourage theft. In the writer's 28 years of teaching, the only item lost or stolen was a 35 cent nail set. However, theft can become a serious problem.

10. Keep a complete and accurate inventory of all hand tools, equipment and accessories, and library books.



Details of brace and breast-drill holder

All holders should be so constructed that the weight of each tool holds it in position — straight and perfectly balanced. (See marking gauges and hammers.) Before placing the holders in position on the panel, all should be given one coat of paint. When dried they may be securely fastened with screws.

When all holders have been fastened to the panel another coat of paint may be applied. After drying, paint on the tool silhouettes and allow them to dry. One or more coats of varnish may be applied to the complete panel. This varnish coat is an aid in dusting and cleaning. If the purchase of additional tools is contemplated holders for all may be put on the board, but paint only silhouettes for those tools immediately on hand. If such be the case silhouettes would definitely need to be used to determine if all tools had been properly replaced on the panel.

The use of individual panels for the accessories of each power machine has been enthusiastically accepted by students in all classes. These panels are conveniently located on the wall near each machine. The same color schemes were carried out in the painting of all panels. Also, the same factors and rules were applied in the planning and making of each holder for these accessories. As an illustration, short pieces of dowels were used as holders for the various shaper cutters. Above each dowel or cutter was a label with the catalog number and name of that particular cutter. This was found to be a valuable aid in teaching the nomenclature of each accessory. Handy cabinets were provided for each of the lathes and fastened to the machines with screws. Calipers — inside and outside — as well as slip stones are in holders on the back of the cabinets with a holder for the turning chisels fastened to the inside of each door. When the door is opened it is convenient for a student to see and pick out the desired tool and replace the one in hand. (See lathe panel.)

After studying and reading through all old issues of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, the article by Gerald L. Waltrip in the March, 1951, issue on "Holders — Their Design, Construction, and Location on the Tool Panel," was used as a main source of reference. Many of the holders designed and used as shown in the illustrations are the same as those shown in Waltrip's article; the only changes made were for increased safety or appearance.

TWO PRACTICAL STORAGE UNITS FOR LATHE TOOLS AND ACCESSORIES

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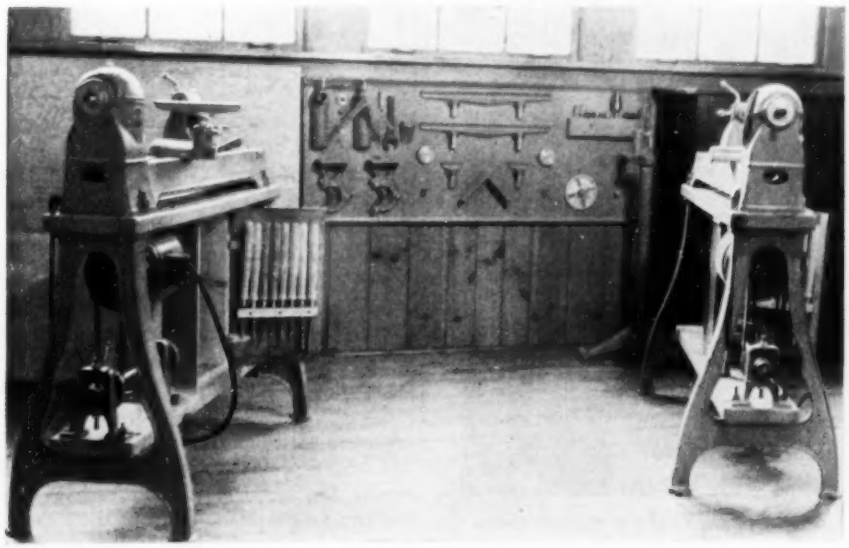
The orderly storage of chucks, faceplates, wrenches, and other lathe equipment is a problem in any machine shop. In a school shop it is even more difficult to do this efficiently because students are always in a hurry and usually neglect to restore tools to a prescribed storage place.

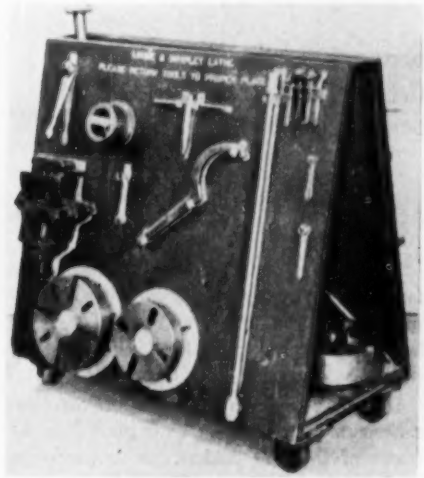
The first consideration in design of storage facilities should be to make them practical and accessible. If this is done it will be little or no more effort to place tools in their proper place rather than set them down on any convenient bench or window ledge.

I have been attempting to eliminate the hanging of any tools on the machines themselves for several reasons:

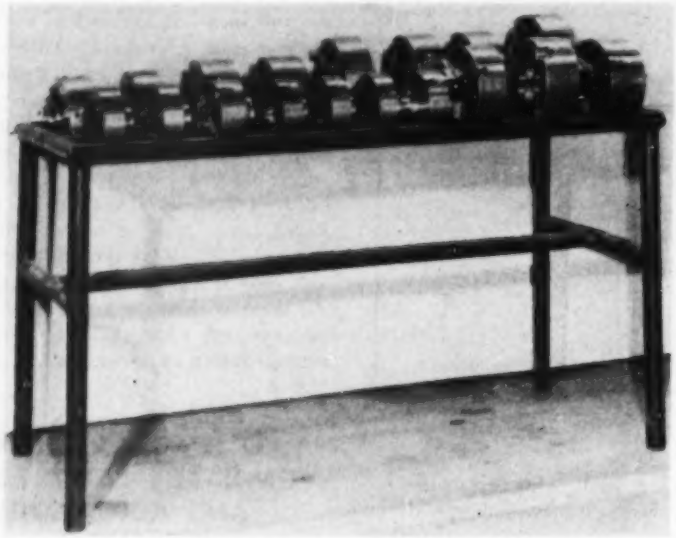
1. Tools hung on a machine produce an



Lathe tool panel



Movable rack for lathe tools



Rack for storing lathe chucks

appearance of disorderliness, and proper operation of the machine is often difficult.

2. Such tools also impede the thorough cleaning up of the machine after use.

3. Furthermore, they are dirt and chip catchers.

We have in our shop a fairly adequate tool crib with a full-time attendant, but we do not believe it is wise to store heavy accessories in this crib because of the labor involved in checking them in and out for each class. We have also found that time is gained by storing as many tools as possible near the machines on which they are used.

The stationary chuck rack pictured is used for storage of chucks for 18 small engine lathes. We had previously stored these chucks on wood pegs fastened to the lower frame of the lathe. This was not satisfactory due to the labor involved in lifting them from the floor to the spindle of the machine. Also, when cleaning the machine after using it, the chips and dirt naturally fell onto the chuck stored below. The chucks were also very difficult for the instructor to inspect at the close of a class.

The presently used rack solves all of these problems and more. By leaving the design very simple there is no possibility of chips collecting in a place hard to clean. They simply fall through to the floor. We instruct our students to clean the chucks with compressed air right at the rack before and after using. The rack is also at a convenient height so that an operator can take a chuck from storage to his machine without stooping or bending his back. This is an advantage particularly with the heavier chucks. It is a good plan to number all lathes and chucks with a corresponding number to facilitate identification.

The movable rack pictured is used for tool storage for our larger lathes. All accessories for these lathes are kept on these racks except for a few precision tools such as collets. Each movable rack is mounted on large casters and each rack serves two lathes. Most of the equipment is mounted directly on the face of the panel and the proper positions are silhouetted. When moving large chucks we instruct two students to team up in order to avoid back injuries.

All of this equipment is built of common material that is usually available in any school shop. The frames are of steel pipe with welded joints. The basic designs can be easily modified to satisfy individual preferences of other teachers.

Cleaning Up and Checking Out

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Department of Public Instruction
Salt Lake City, Utah

The method described here was devised to facilitate the hourly cleanup problem, and to speed the cleaning up and distributing of housekeeping responsibilities in large shop classes.

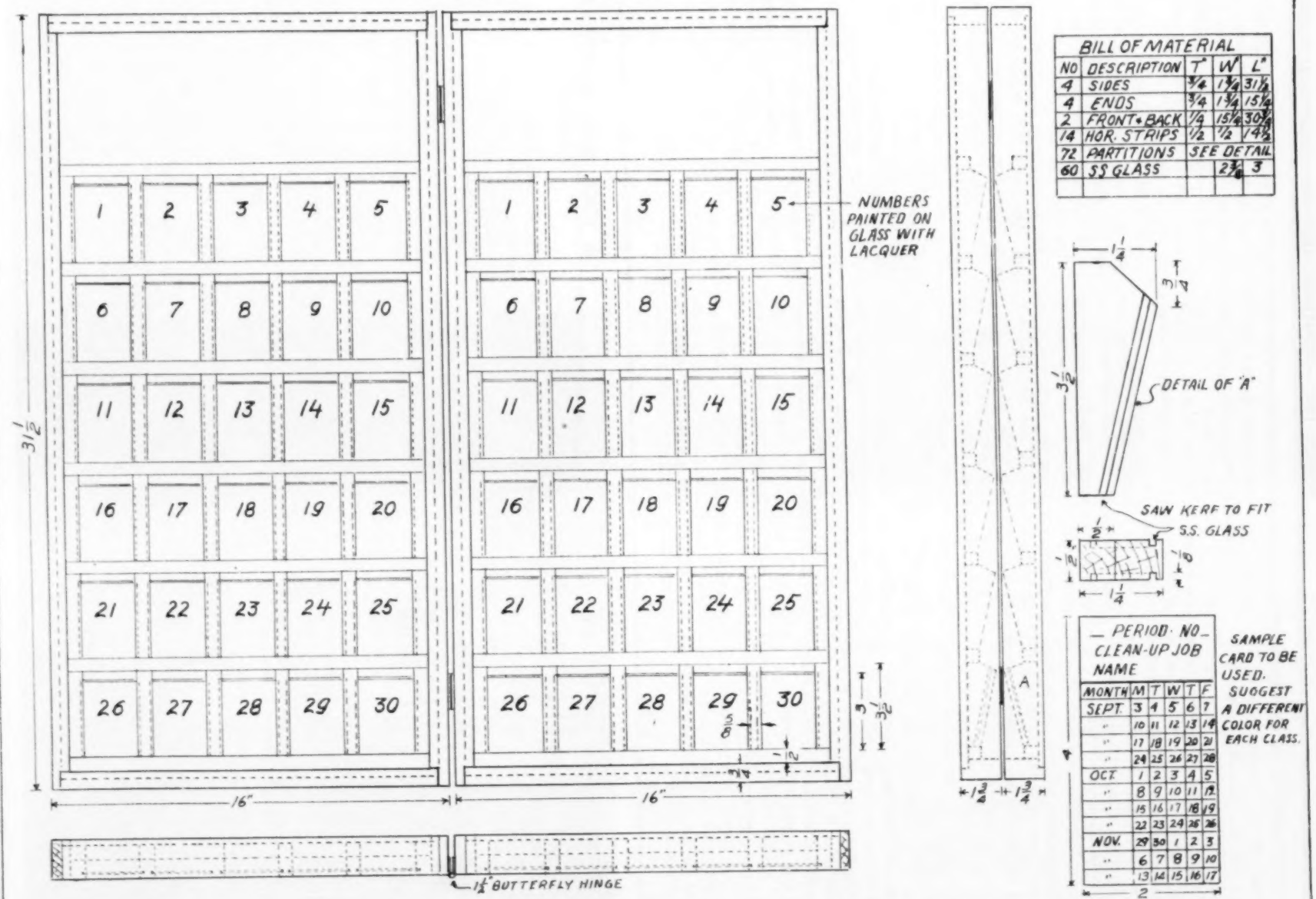
By using a different color of card for each period and glass or clear plastic on the fronts of the card holders, the instructor or student shop superintendent can see at a glance the cleanup jobs neglected at the end of the period.

Moving card to show that cleanup job has been done

In order to make a quick study of this device and see if it fits the reader's particular needs some explanation is necessary.

Begin by making a list of cleanup jobs needed each period to maintain neatness and orderliness in the shop, i.e., picking up waste stock, brushing off machines, checking the tool panel, checking the drawing tools, hanging up clamps, turning off the gas at furnaces and ovens, closing open vises, sweeping the floor, ringing the cleanup bell, etc. Some jobs will be easier than others. Some jobs will require two or more students such as tool checker, floor sweeper, etc., but there should be a job for every student. It does not mean

CLEAN-UP CHECK-OUT CABINET



BILL OF MATERIAL				
NO	DESCRIPTION	T"	W"	L"
4	SIDES	3/4	1 3/4	31 1/2
4	ENDS	3/4	1 3/4	15 1/4
2	FRONT & BACK	1/4	15 1/4	30 1/2
14	HOR. STRIPS	1/2	1/2	14 1/2
72	PARTITIONS	SEE DETAIL		
60	SS GLASS		2 3/8	3

— PERIOD · NO. —
CLEAN-UP JOB
NAME

MONTH	M	T	W	T	F
SEPT.	3	4	5	6	7
"	10	11	12	13	14
"	17	18	19	20	21
"	24	25	26	27	28
OCT.	1	2	3	4	5
"	8	9	10	11	12
"	15	16	17	18	19
"	22	23	24	25	26
NOV.	29	30	1	2	3
"	6	7	8	9	10
"	13	14	15	16	17

SAMPLE CARD TO BE USED. SUGGEST A DIFFERENT COLOR FOR EACH CLASS.

Plan for the clean-up check-out cabinet

that a student should not clean up his own work station. This is expected of every student, and then he checks on or does one of the above listed jobs to which he is assigned.

Upon the completion of his checking or doing his assigned job he moves his card to the corresponding numbered card holder on the other side of the cleanup cabinet. He then awaits word of class dismissal from the shop superintendent or the instructor.

In case a student does not move his card and neglects his job a red cross can be placed on the date on his card and he can be penalized according to the instructor's wishes — denied privileges, markdown in grade, given demerits, and so on. An instructor may give the student a chance to redeem his neglect and the mark be taken off the card.

In case of the absence of a boy, authority should be given the shop superintendent to ask members of the class to fulfill or check on the assignments of those absent. If there are enough boys in the class one or two may be called extras with the responsibility of taking care of jobs left by absenteeism.

How to allocate or make the assignments can be done in many ways. A fair way would be to let the students draw numbered slips of paper from a hat or other container. They then would assume the job corresponding to the number for a month, report card term, or whatever length of time deemed suitable by the instructor. A little fun may be introduced by including a blank slip of paper. The student drawing the blank may have his choice of jobs or even go without a responsibility for the term.

After the jobs are drawn or assigned each student should get the check out card corresponding to his number. Read the instructions on the back of the card — be given an opportunity to look for the work to be done, ask questions about it, and then explain to the class what he is to do.

It is always good education to work out some of the problems which arise out of this arrangement with the students. By allowing some of their guided thinking to become part of the job they respect and abide by the rules they help to set up.

To make the cards requires some time. The ruling, numbering, and titling of the cards can be done by the students. Each one does his own. The instructor, as always, will have to make up the cards for those who just can't do it or ask some fast student to make two or more. The facilities of the printing department can be called on if the school is so fortunate as to have one, or perhaps a stencil can be cut and enough cards run to last for 2 or 3 years. The explanation of the job on the back of the card would have to be written, typed, or printed individually — however a permanent index of numbers with the corresponding jobs could be posted near the cleanup cabinet.

A 4 by 6-in. card will make three cards of the right size. Index Bristol card, 110 wt. can be purchased in any color. At the cost of 10 cents per 25½ by 30½ in. sheet of this paper, 90 — 2 by 4-in. cards can be cut.

The cabinet can be constructed as a hollow box, then cut in half through its thickness, hinged, and then the partitions and divisions be put in place. It is recommended that the ¼ panel backs be dadoed and plowed 1/16 in. to receive the partitions before assembly.

The space at the top of the small card holders can be utilized for slogans, announcements, or as a bulletin board.

One side of the cabinet should be permanently hung or screwed to the wall. On days when class work is to be held, a test to be taken, or some visual aids to be used, the cabinet can be closed and the appropriate announcement card can be slipped into the holder or clips on the back of the cabinet. These cards may be enlivened by some little cartoon depicting the activity to be observed that particular period or day.

View of tool and hardware cabinet with doors open

A TOOL AND HARDWARE CABINET

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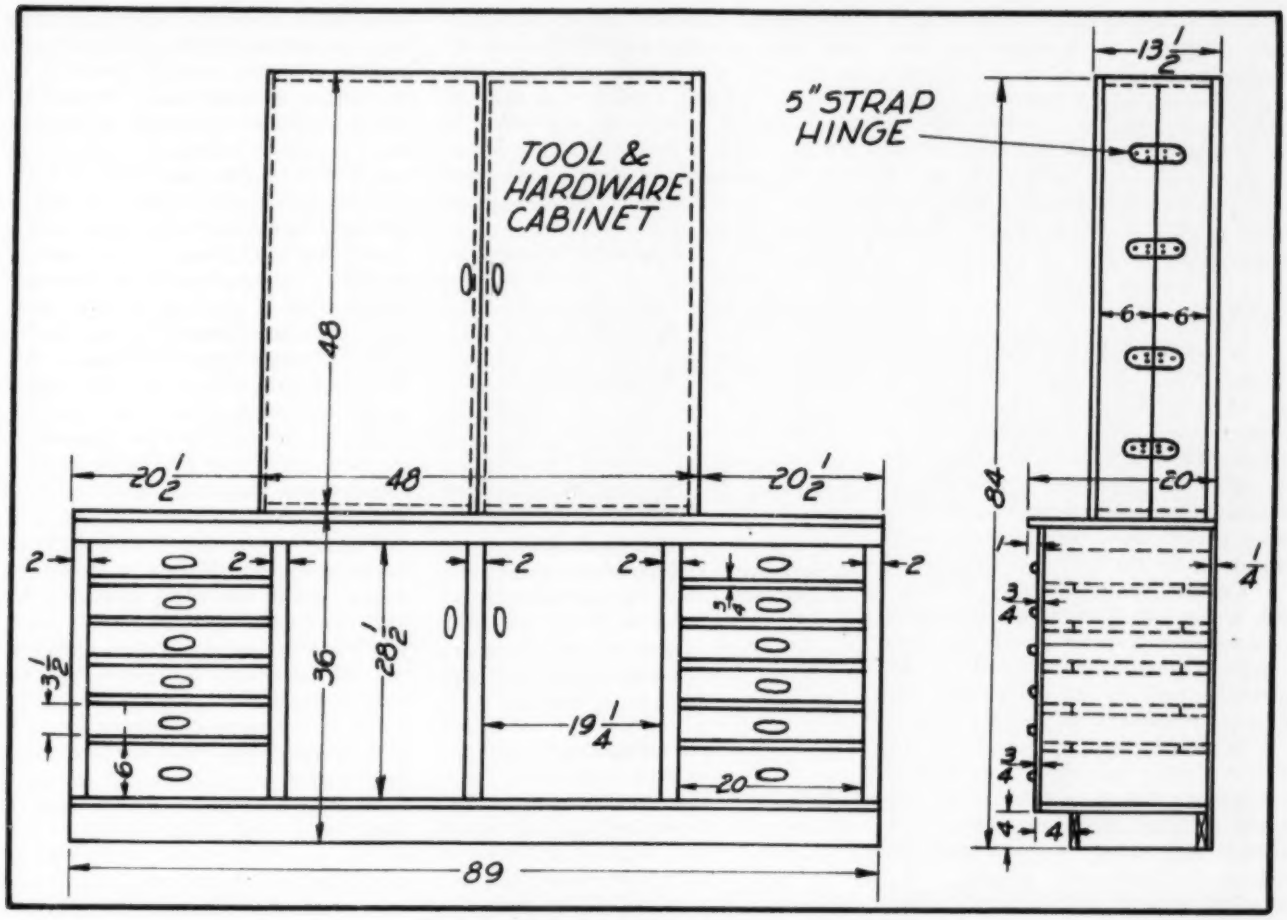
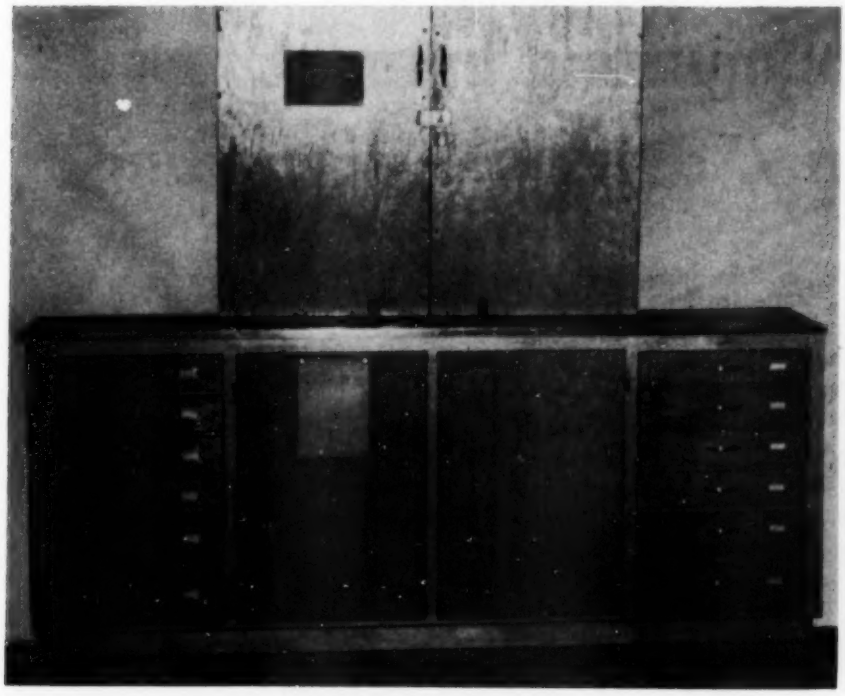
Faribault Public Schools
Faribault, Minn.

The students of the vocational building trades class at Faribault High School designed and constructed this efficient tool and hardware cabinet. The cabinet houses all the necessary hand tools and hardware needed for the average industrial-arts class. All screws, nails, hinges, sandpaper, and miscellaneous items are catalogued for easy access. The cost of the entire cabinet runs approximately to $75.

U. S. farmers and ranchers operate more than 10,000 planes. About half are equipped to do spraying and dusting. In eight hours, an air-borne farmhand can plant, fertilize, or spread insecticides on 1500 acres. Petroleum not only makes possible the operation of these planes but is a vital ingredient in many of the fertilizers and insecticides which they use. — *Petroleum Newsnotes.*



Plan for the tool and hardware cabinet



Tool and hardware cabinet

HOW TO CREATE AN IDEAL HIGH SCHOOL SHOP

ALFRED GRAYSHON
Olney High School
Philadelphia, Pa.

This subject is quite controversial. However, there must be agreement that any arrangement requires organization by those directly in charge.

It must be recognized that school shops are places for planning, experimenting, testing, and developing desirable skills, attitudes, and habits. Planning should be directed toward desirable goals of pupil health, safety habits, and preparation for present and future needs of the school and community.

The school shop should be planned to provide in high school for at least 60 sq. ft. per pupil or 2200 sq. ft. for a class of 24 pupils. The shop should be suitably placed, and well lighted and ventilated. There should not be more than 24 pupils in any shop class and there should be sufficient tools and machines or benches

to provide an ample pupil station for each pupil. Doubling up is dangerous. The equipment selected should be the standard fundamental industrial type. Special machinery is too expensive to maintain for general school usage as it is designed for quantity duplication rather than to be applied to training elements. Vocational schools could have some of the simpler automatic machines set up for instruction where the product can be used in school maintenance.

Strive for Good Organization

A high school shop should be organized for orderly procedure to absorb as much useful time as possible. It should be set up akin to an industrial situation, time and equipment permitting. It should never be less than two school periods. The sustained periods allow better interest in an assignment for the following reasons:

1. Certain time-consuming situations such as machine preparations and operations, tool requisition and accounting, heat-treating, assembly, finishing and cleaning up (both pupil station and person), become impossible with any single period.

2. A short lecture period or demonstration very often is necessary to brief or correct the group on procedures, and it is unwise to expect too much carry-over to another day unless it is a repetitive process.

3. Adjust the pupil already used to short periods, to the more rigorous and exacting time schedule of employment for a full day.

There should be plenty of projects with blueprints for pupil selection under advisement, so that he will not select one beyond his capability or interest. The development of the pupil is best through actual usage of the machines and tools. Lecture and demonstration can never replace manual contact for attention and experience. The pupil must work with his hands. The pupil must acquire the habit of orderly procedure methods in the performance of any task, such as:

1. Careful examination of assignment to find out requirement.

2. Selection of tools and materials, keeping them in an orderly manner.

3. Have a definite step by step plan.

4. Survey his working position to account for tools and materials with orderliness before he leaves the shop.

Maintain an Orderly Shop

An orderly shop should be a routine situation, with complete understanding between teacher and pupils which permits rather than retards proper activity with the least policing required. There should be sufficient reference charts, catalogues, and project displays and the floors should be kept free of any material or loose machine parts. Adopt a policy of *A place for everything, everything in its place.* A new class should be initiated into proper shop deportment involving machinery and tools by giving each pupil reference sheets on shop conduct, safety and machine usage, together with a lecture on each mentioned item. Schedules should be arranged for job accomplishment to avoid procrastination. The students must be shown that their limited time must be used to the best advantage. Sandwich in maintenance work. Avoid pupil idling. A good teacher, by example, encourages pupil participation and good character of work. The pupil will soon sense the teacher's ability and respect it.

If tool dispensing is handled by pupils, suitable tool display panels or racks should be arranged to show the tools individually, in pairs, or by sizes of a kind for quick teacher check, otherwise the dispensing should be done through a tool clerk with tool slips or checks as in industry.

Difficulty of Obtaining Good General-Shop Teachers

While it is contended that it is economical to provide a number of areas of activity in one room, known as a general unit shop, it is questionable in the minds of many teachers about the accomplishment. In the first place, teachers broadly trained and basically capable of handling such a shop are not usually obtainable, particularly now with industrial competition, and educational opposition to recruits not having the latest standards of educational preparation. Either the persons obtainable have an affinity for some particular phase of a material field or they have a vague preparation and no experience in the field of their choice. The latter group seems to be the only type now available, and it results in poor shop management with misleading preparation of the pupils for future working habits and understanding of industrial requirements. Any shop teacher should have had some industrial experience as well as an opportunity for industrial visitation to acquaint himself in proper procedure so that the pupil product is less likely to require untraining to fit into a job. It is truly astounding when a publisher will ask an author to compile his text simple enough for the teacher to understand. It is equally disquieting when the industrialist states that the high school pupil usually loses his first job, and many times his second job, because he does not know how to work or take orders.

Stimulating Interest in Architectural Drafting

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The Stout Institute
Menomonie, Wis.

DONALD LEACH
Industrial Arts Department
Wisconsin Child Center
Sparta, Wis.

JOHN DEBRAUSKE
Industrial Arts Department
North Judson, Ind.

"Why should we take architectural drafting?"

"When do we ever put our drawing skills into practice?"

"How does architectural drafting co-ordinate with our other industrial-arts courses?"

Plagued by these questions from high school sophomores, juniors, and seniors who frequently inquired about the architectural drafting course at Menomonie high school but seldom enrolled, two cadet teachers of Stout Institute — whose cadet assignment was the responsibility for the sparsely patronized course — decided that their remedy lay in co-ordinating the structure and detail of carpentry with the techniques of architectural design.

The cadet instructors felt that such co-ordination, if it could be achieved, would create greater interest in the architectural drafting class, provide clear learning to participants, and show unmistakably the importance of architectural design in an actual building situation.

Once the value of the course had been *sold* to industrial-arts students in the high school, a year-by-year increased enrollment in architectural drafting could be anticipated.

To achieve their goal within the limits of a one-semester course having a limited budget, the cadet teachers sought a project which was inexpensive, could be completed within a semester's time, made use of the students' previous knowledge of industrial arts, and co-ordinated the structure and detail of carpentry with architectural design.

The two teachers-in-training consulted with Dr. J. E. Ray, head of Stout Institute's department of drafting; Dwight Chinnock, supervisor of student teaching at the college; and K. T. Olsen, associate professor of woodworking and carpentry at Stout. As a result of these conferences, a scale model one-car garage was chosen as an appropriate project. Using a scale of ½-in. to one foot, the model of a 12 by 24 ft. garage would be planned and built.

However, the semester's work was to teach more than merely the construction of a scale model building. Students were first required to draft a complete set of scale plans including foundations, footings, elevations, cornices, and roof details.

Lettering and symbols for the plans were carefully taught and the finished plans painstakingly checked. Specifications and a bill of materials for all interior and exterior materials were also required, with stress laid upon consumer knowledge of the qualities of building materials and their purchase.

After the planning and drawing phases of the project were thoroughly understood by all participating students, actual construction began — from the ground up. Characteristics of varied types of soils were first discussed and then a simulated plot of ground was made of 3/16-in. hardboard. On top of this was laid cinder fill (screened cinders mixed with adhesive), covered by a floating cement slab (Keene's Cement). The balsa wood walls, of platform construction, were then raised individually.

As the walls included provision for floor and window construction, students had an opportunity to design and work with headers, trimmers, and cripple studs, together with regular studs and plates included in wall construction.

Members of the architectural drawing class of Menomonie High School, instructed by cadet teachers of The Stout Institute, observe how a model garage which they have planned and constructed co-ordinates the structure and detail of carpentry with architectural design

Rafters were cut to exact length, complete with a heel cut. A roof, neatly shingled with cardboard shingles, was then added. Plastic window panes were also fitted in place. Painting was planned and done by the students under the direction of George Soderberg, assistant professor of general finishing at Stout Institute, and cadet instructors in that department.

Success of the project could be measured in several ways. Participating students expressed their enthusiasm, a good advertisement for increased class size in the future. The approval which the enterprise received from W. G. Ballentine, superintendent of Menomonie public schools, and R. H. Bongey, principal of Menomonie high school, resulted in the display of both the drawings for the garage and the scale model itself at a public showing in the high school.

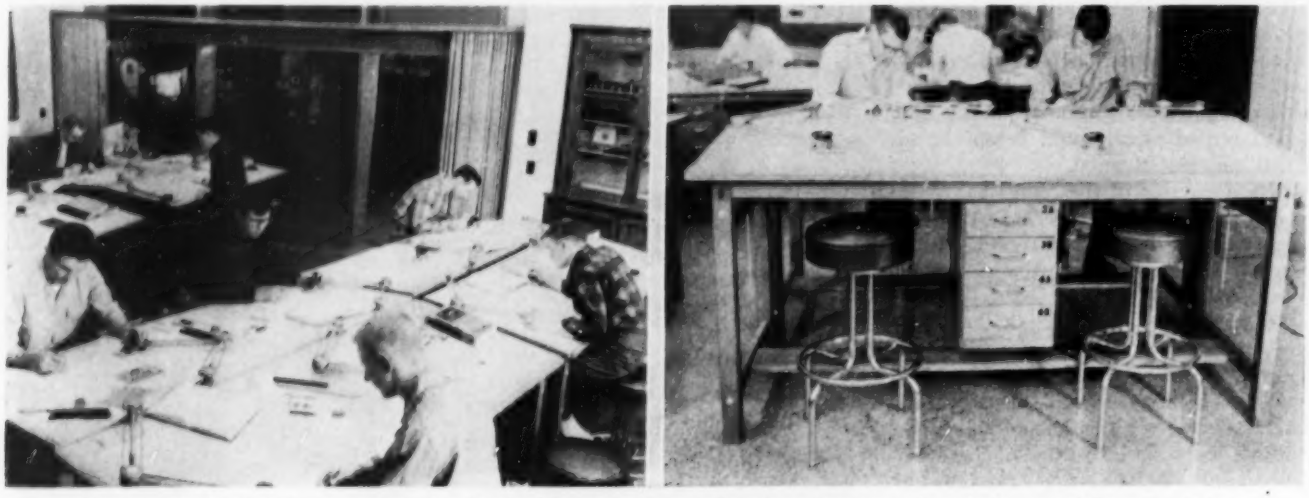
In addition, participating students, teachers, and schools received wide and favorable publicity in the daily and weekly newspapers of the area — a pleasant reward for any educational endeavor.

Modernizing the Drafting Equipment

W. H. WAGNER
Industrial Arts Department
Iowa State Teachers College
Cedar Falls, Iowa

In the development of the industrial-arts program, we have seen a gradual transition in the physical setup from one in which hand tools predominated, to present-day layouts consisting of many power machines. These machines include individual drives, special attachments and accessories and are not unlike those found in industry. They increase the range of student experiences, that can be included in a given time, and provide a setting which reflects to some extent our modern industrial age.

In the areas of woods and metals this trend toward the use of power machines has been especially noticeable and schools



At left — student stations equipped with drafting machines. Fluorescent strip ceiling lights provide more than 50 foot candles of diffused light on all work surfaces. At right — custom-built two-station drafting table saves floor space

have invested large sums of money for lathes, saws, jointers, milling machines, shapers, and other power equipment.

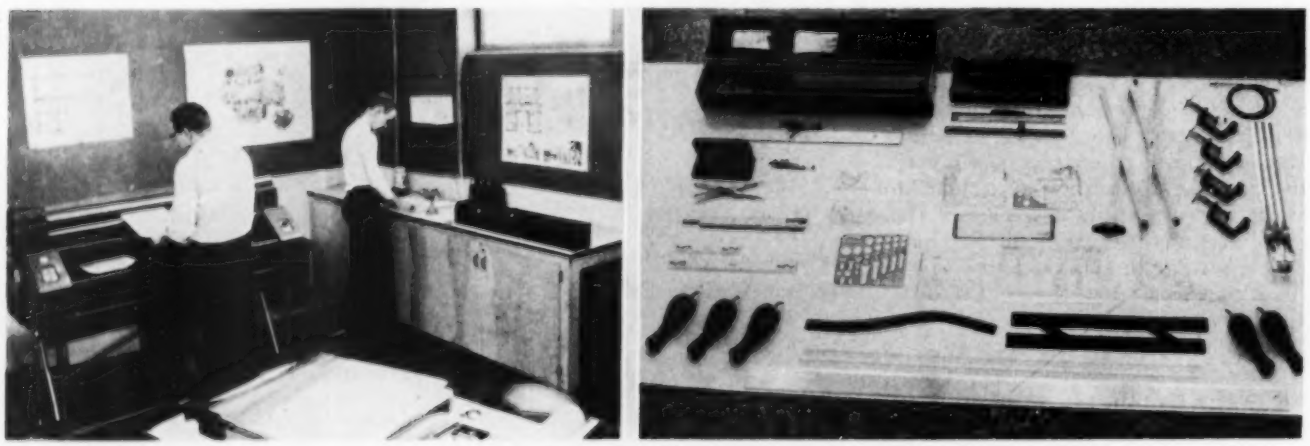
The drawing area, however, seems not so universally affected and for the most part still includes the traditional drawing board, T squares, and triangles. The case of drawing instruments still looks like those of several decades ago including extensive equipment for inking, even though with the improvement of reproduction methods and equipment, industry does most of its work in pencil.

Drafting materials still include thumbtacks for attaching a heavy buff detail paper to the drawing board. The original drawing is set up with few aids to make the work easier and faster, and then traced sometimes in pencil but too often in ink. Little wonder some instructors report difficulty in creating interest in drafting problems.

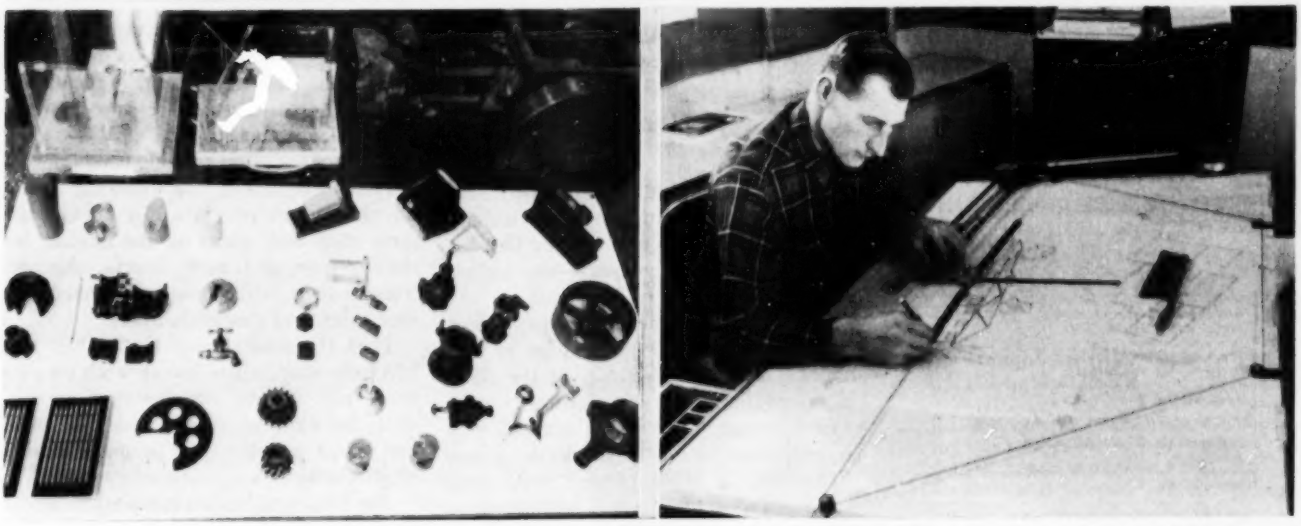
It would seem reasonably urgent that the industrial-arts teacher evaluate his drawing program and equipment in the light of present-day practices in industry. Why not make the original drawing directly on tracing paper if it is to be reproduced? Why not use some of the tools and devices that modern industrial drafting rooms have found to be effective in speeding up work and increasing accuracy?

Some drafting room furniture and equipment has been designed especially for the school situation. Recently several companies have placed on the market small drafting machines with 14- and 16-in. arms which are highly adaptable to the usual student work station. The drafting machine combines all the functions of the drawing board, T square, triangles, scales, and protractor in one convenient unit. It is controlled completely with the left hand, leaving the right hand free for pencil manipulation. The machine reduces drafting time and permits a higher standard of accuracy.

It is now possible to purchase drafting instrument sets which are custom made. The instructor can select only those instruments which will apply to his course and situation and thus effect a saving by eliminating the need to purchase some of the seldom used accessories. This will also reduce the total amount of equipment to be continually checked and maintained. The master bow compass has become popular among draftsmen in recent years and could easily replace the usual instrument sets in beginning classes. It might be de-



At left — reproduction area. At right — specialized drafting equipment includes mechanical lettering devices, pantograph, pictorial drawing device, proportional dividers, drop bow, templates, ducks and splines, and flexible curve



At left — Visual aids. At right — The pictorial drafting device simplifies the preparation of perspective drawings. The spring cable can be removed and the scales locked in various positions for isometric or other types of pictorial work

sirable to equip a student station with a drafting machine and a master bow, thus eliminating many pieces of equipment and providing a situation more comparable to industry.

The draftsman depends on a number of templates that permit him to draw with great speed a variety of standard parts, nuts, bolts, rivets, small holes, and ellipses. Some of these devices might well be included in the industrial-arts planning and drawing area, not as standard equipment at a student station, but made available along with other specialized equipment for occasional use.

Other specialized equipment, such as flexible curves, ducks and splines, proportional dividers, pantographs, and lettering guides, may deserve their inclusion on the basis of their demonstrative values. Even though the industrial-arts student may never actually use all of this equipment, it would seem desirable for him to know it exists and be aware of its purpose.

Maintaining cleanliness is a continual problem. A drafting brush will aid in removing graphite particles and eraser crumbs from a drawing that is being made. Covering the drawing table top or board with a drawing board surface material will be found helpful. This material has a plastic surface coating to which dust and dirt do not readily adhere and that can be easily cleaned with soap and water when it does become soiled. It is available in white or light green tints that make a very satisfactory background for drawing directly on tracing papers and cloth.

Good procedures require the student to solve many of his problems in sketch form. An "A" size sketch pad of an inexpensive tracing paper makes it possible for him to trace rapidly part of a previous solution or design in the course of its development and improvement. The tracing pad also permits the use of a co-ordinate line grid. This provides a guide for drawing lines as well as a convenient means of proportioning the various views of the initial sketch.

Visual aids will add to teaching efficiency and should be included in the equipment outlay. The beginning student can gain an understanding of the theory of orthographic projection more rapidly when plastic projection boxes with hinged sides are included in this presentation. Sample patterns, castings, forgings, and machine fasteners, will help him understand such items as rounds, fillets, run outs, and thread contours. Machine parts and objects which have been cut apart will clarify the purpose, need, and representation of sectional views.

A great variety of reproduction equipment has been developed which makes obsolete the older blueprinting methods. Most continuous or production blueprinting machines are too large and expensive to be practical in schools; however, many of these same processes can be demonstrated and experience can be gained with smaller incandescent light blueprinters and hand-operated developing rolls. These smaller direct printing outfits are not expensive and require no special plumbing, ventilation, or drying equipment. The opportunity for the student to reproduce his drawing will give him a more intimate knowledge of the end use of all mechanical drawings. In addition, he will more fully appreciate the importance of good line technique as he analyzes the quality of the print produced.

At Iowa State Teachers College, an attempt has been made in recent years to modernize the equipment in the planning and drawing area. The accompanying pictures will give some idea of the present equipment included. Although there are no accurate data to cite, it is generally felt that through better equipment the student is able to secure a greater variety of experiences in a given time and that the standard of work is higher. This in turn has raised the level of his interest and appreciation for this particular area.

CHECK LIST FOR MECHANICAL DRAFTING CLASSES

MERVYN T. JONES
Drafting Instructor
Thomas J. Stewart Junior High School
Norristown, Pa.

In teaching junior high school mechanical drawing classes, it is frequently difficult to keep track of exactly what drawings or plates each student has completed. The usual class roll book does not have sufficient space to record much more than just the grade which the pupil has made on a given drawing. If you try to analyze the grades to show him or yourself where he is weak, it is difficult to remember which type of drawing was his weakest or strongest.

To overcome this in my classes, I have designed a form which gives me and the pupil a constant over-all picture of his work in drawing class.

Name .....

Homeroom..... Section.....

Teacher .....

DRAWING CHECK LIST
INDUSTRIAL-ARTS DEPARTMENT
STEWART JR. HIGH SCHOOL

Plate No.	Description of Plate	Date Completed	Grade
1	*Freehand Drawing of Horizontal and Vertical Lines*		
2	*Freehand Drawing Orthographic Projection*		
3	*Same as No. 2*		
4	*Orthographic With Hidden Lines*		
5	*Same as No. 4*		
6	*Dimensions*		
7	*Freehand Isometric*		
8	*Freehand Isometric From Orthographic*		
9	*Same as No. 8*		
10			
11			
12			
13			
14			
15			
16			
Extra Credit	*Lettering Sheet*		
Extra Credit			
Extra Credit			

The form shown here is made on index paper 6½ by 8¾ in. The size can vary of course to suit the particular case. My students have a plate number on each drawing and on the form I can write a short description of the plate, also record the date completed and a grade for each plate. A space is provided for pupil's name, home room, and section. At the bottom of the form, there are spaces provided for any extra work the pupil may do.

I have had these made in three different colors for seventh, eighth, and ninth grades, so that there is less chance of confusing the students or the teacher. These forms did not seem necessary, just like many other forms, but after using them for one term, I have found that they save very much time, and more important, it helps you to do a better job of teaching mechanical drawing.

TEACHING AID FOR THE AUTO SHOP

WAYNE RUDESILL
Instructor, Boys' Technical High School
Milwaukee, Wis.

At Boys' Technical High School, Milwaukee, Wis., the auto-shop curriculum, under the chairmanship of Harvey Genske, is divided into two courses — the technical course and the trade course.

The technical course provides a student with enough academic preparation to render him eligible for college, at the same time providing sufficient shopwork.

In the trade course, the student gets more shopwork and fewer academic classes.

However, a student may take both technical and trade courses, graduating as a tech-trade student. With such an arrangement, an additional year of work may be required to place a student on the 12A level. He will, of course, be eligible for college entrance.

At the ninth-grade level, a boy is exposed to exploratory auto shop, and if he is interested, he goes into 10B auto shop the next year. In the 10B auto shop, he is introduced to the parts of the engine, chassis, and the power flow of the automobile. The following semester he goes into 10A auto shop. Here he studies auto electricity, to acquire an understanding of the electrical system of the car. He is required to wire the ignition system and to time an engine.

In the 10B and 10A auto shops, the class is held for two periods, five days a week, for 18 weeks. This is for technical and trade students. From here on, the technical student still is in class two periods, five days a week, for 18 weeks, but the trade students attend four periods per day, five days per week, for 18 weeks.

In the 11B auto shop, both technical and trade, the boy studies theory and works on the overhauling of motors. The shop is set up so that the student can learn motor overhauling on the shop cars which are part of the shop equipment. Students are so guided that they get a chance to work on an I head, L head, and a V-8 engine. These cars are all in running condition.

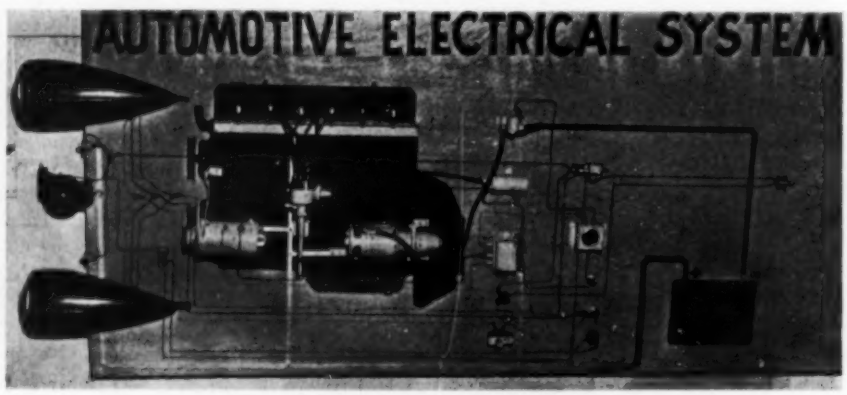
From here, during the following semester, the student goes into 11A work in the same shop and works on the chassis, including front end work, brakes, clutches, transmissions, drive shafts, differentials, rear axles, and shock absorbers.

Then the student goes to the 12B and 12A auto shop, where he can work on cars which are brought into the shop by students for different kinds of jobs. In these two shops he also gets trouble shooting of all kinds.

The *Electrical System* is placed on an old blackboard no longer in regular use. The old paint was sanded off and the board was repainted with blue-green enamel. Students in the 11A auto shop did most of the work. They figured out how the board should be wired, and when some troubles were encountered, they went to a manual or directly to a car to ***figure it out.*** The outline of the engine block is painted on in black, and all the accessories such as: generator, distributor, coil, etc., are painted yellow. This *automotive electrical system* on the board consists of the following parts: lights (head lights, parking lights, stop light, and brake light); switches (starting, light, horn); coil, distributor, generator, battery (painted on, but a regular battery can be hooked up); ammeter, voltage regulator, spark plugs, horn and relay, and all wiring to connect these various parts, including a strapiron, which connects parts to make their ground. The wires of different colors and sizes are used for each circuit.

This *wiring system* board is used when the student is not sure what a wiring system of a car really looks like. He can go

(Continued on page 48A)



Teaching aid for the auto shop

there's a *Hamilton*
student table
to meet every requirement

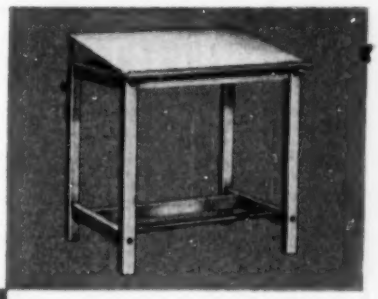
Whether you're buying a single table or completely equipping a new department, you can depend on Hamilton equipment—designed, built and priced with school budgets and student use in mind.

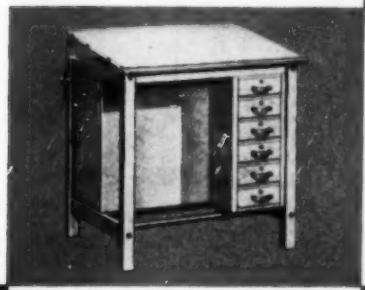
From the sturdy, good-looking 3-unit Student Drafting Table Assembly to the simplest drawing table, you'll be impressed with the traditional quality and budget economy that has made Hamilton the industry pacesetter. See your local Hamilton dealer, or use the coupon below for a complete description of efficient work-designed Hamilton student tables.

Hamilton
MANUFACTURING COMPANY
Two Rivers, Wisconsin

Table V-1620
Length: 38½" Width: 28½" Height: 40"

A basic student table built of Northern Wisconsin Birch. Adjustable top is securely positioned with two handwheels and adjustable rods. Stationary paper ledge at front. Iron pipe footrest. Base unit for Drafting Table Assembly.



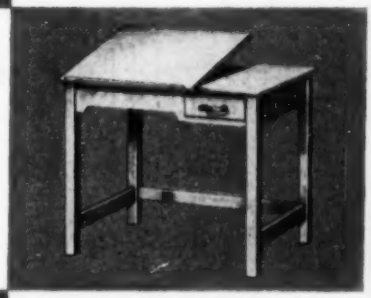


Student Drafting Table Assembly

Space-saving economy is available when tool drawer unit V-1621 and board storage unit V-1623 are added to table V-1620. Storage unit arrangement can be reversed for right or left aisle.

Table V-1703
Length: 36" Width: 24" Height: 30"

26" x 24" tilting top is adjustable. No protruding levers. Drawer 14½" x 9" x 2⅛". Stationary top 10" x 24". Adjustable paper ledge. Steel gliders on legs. Northern Wisconsin Birch construction.



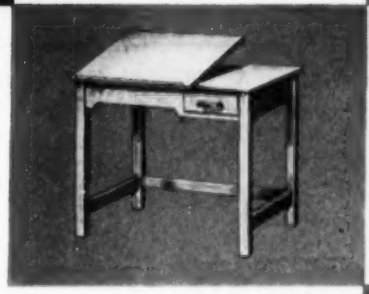
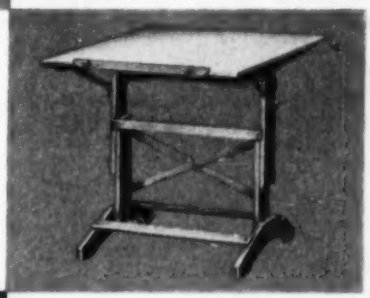


Table V-1704
Length: 34" Width: 20" Height: 30"

24" x 20" adjustable top. No protruding levers. Drawer 14½" x 9" x 2⅛". Stationary top 10" x 20". Adjustable paper ledge. Northern Wisconsin Birch. Smaller version of V-1703.

Table 439
Length: 36" Width: 24"
Height: 30½" - 40¼"

Built of selected hardwoods. Unfinished top is sanded smooth clear-grain soft basswood reinforced with hardwood cleats. Adjustable slope and height is held rigidly by two handwheels.



Hamilton Manufacturing Company
Two Rivers, Wisconsin

Please send me further information and prices of Hamilton Student Tables

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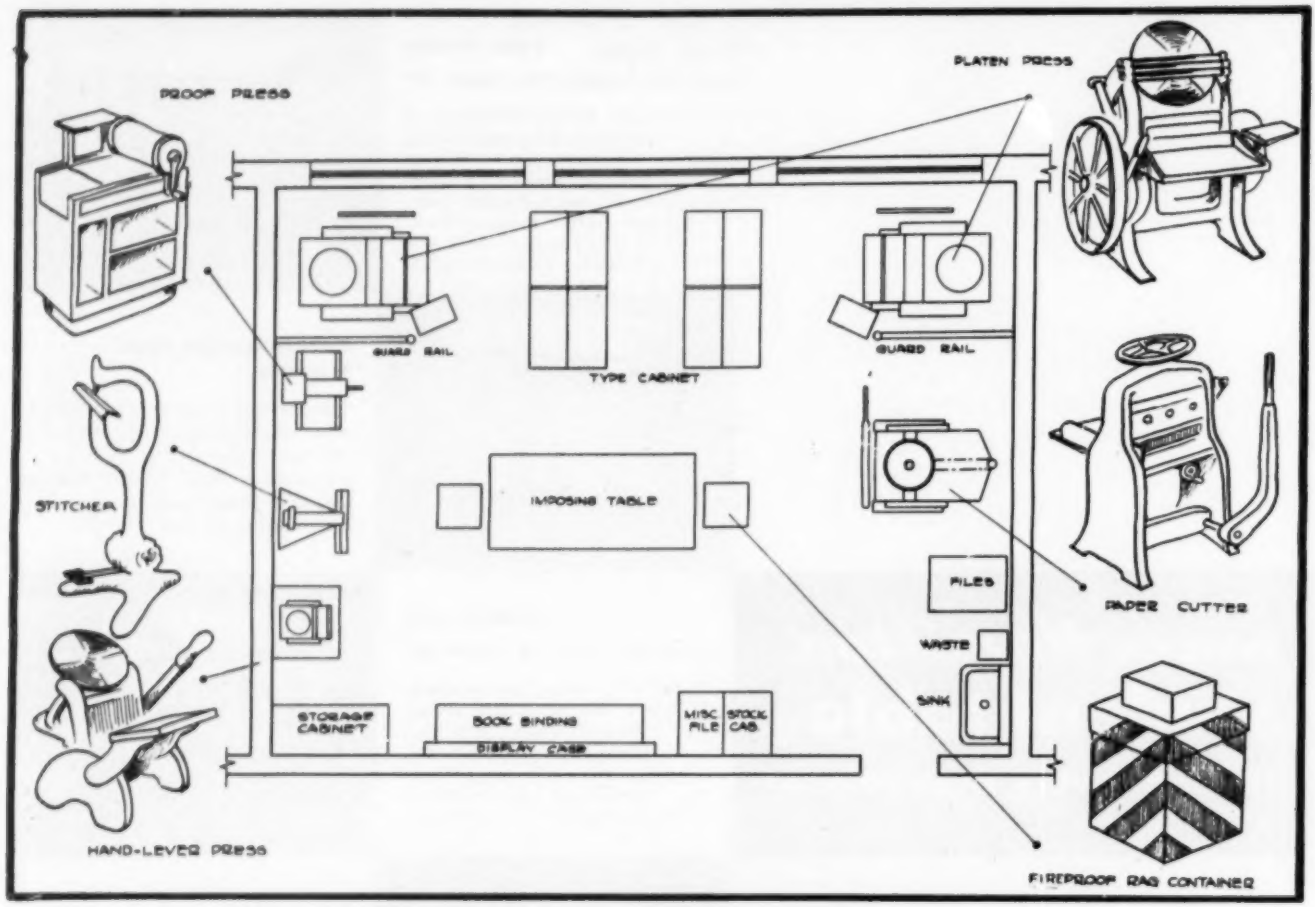
Institution_____
Address_____
City_____ State_____



Planning the Print Shop by Geo. A. Willoughby, Michigan State Normal College, Ypsilanti, Mich.
Drawing by Donald Campbell

Spray Equipment in High School Shops

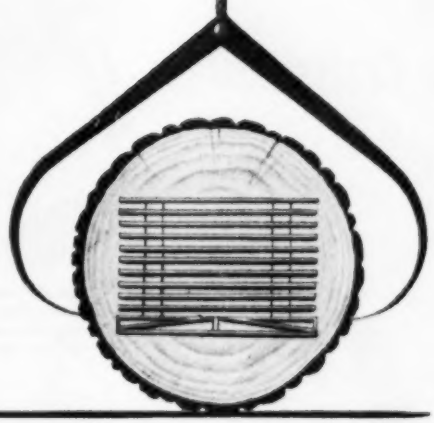
E. D. MEYER
Associate Professor
Industrial Arts Department
Oregon State College
Corvallis, Ore.

The application of a satisfactory finish on student projects is a very real problem to most high school teachers of industrial arts. Finishing is usually treated as a stepchild of woodworking and as a result inadequate facilities are provided. The finish is frequently judged by commercial standards and little consideration is given to the substandard conditions under which the finishing is done. The best efforts of student and teacher cannot overcome the handicap of crowded shops and finishing materials not suited for those conditions. If the application of a finish is thought to be important it should be recognized that proper equipment and materials must be available.

Sufficient space is usually provided for classwork in other areas but storage and drying space for student industrial-arts projects are seldom provided. The shop teacher and students are faced with conditions which compel them to attempt the various finishing operations in a corner of a shop, near dust producing machines

(Continued on page 30A)

QUALITY CONTROL
OF EVERY STEP
ALONG THE WAY
TO YOUR CLASSROOM



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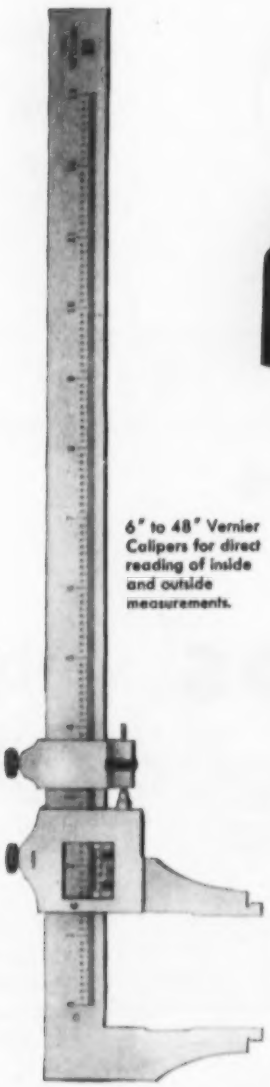

6" to 48" Vernier Calipers for direct reading of inside and outside measurements.

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SPRAY EQUIPMENT

(Continued from page 28A)

or an open door or passageway. Another difficulty can be traced to the finishing materials which are used. The problem of dust is again in the leading role. When dust cannot be eliminated it would seem wise to select finishing materials which are not readily defaced by dust because they become dust-free in a very short time.

What is the solution to the problem? The answer has at least two parts: (1) modern finishing equipment, (2) modern finishing materials.

Spray equipment is the answer to part one and can be inexpensive or as elaborate as the budget will allow. Unsatisfactory results have discouraged some who have tried spray equipment but the difficulties are usually traceable to a poor choice of equipment. There is a minimum standard below which it is not wise to invest money. Modern finishing materials are the answer to part two. Manufacturers of finishing materials are continually searching for new products which produce a high-grade durable finish but emphasis is on the quick-drying qualities of the film. Lacquers, either clear or enamel, have many qualities which recommend them for school shop use as do some of the new plastic-type materials. Lacquers dry dust-free in about five minutes and the plastic films in 30 minutes. Slow-drying films such as oil based varnish, enamel, or paint are usually not dust-free for two hours and during that time the newly coated surfaces may become permanently marred by dust.

Industrial-arts shop methods and procedures have undergone many changes since spray equipment and lacquer products became well known. The band saw has replaced the turning saw, the foot operated lathe is a thing of the past, the power jointer, table saw, and mortiser are now used in most school shops. Why then expect students and teachers to use the bristle brush and finishing materials which years ago were discarded by industry?

What Type of Spray Equipment?

A logical question might be, "What spray equipment is necessary and how much would it cost?" The purpose of this article is to list the minimum essentials and not to compare the products of several manufacturers. A very important piece of

equipment is a suitable and adequate air compressor. The tendency is to install a compressor which is too small to supply the required volume of air at sufficient pressure. This statement is frequently made, "this compressor will pump 100 lb. pressure." Pressure is a necessity but it is one factor only, the other is volume. A spray gun of proper size and design requires a minimum of 5 cubic feet per minute at a constant pressure of 40 lb. per square inch at the gun, and a volume of 8 cubic feet at 50 lb. is a great deal better. A small compressor creating a pressure of 100 lb., but unable to maintain that pressure for more than a few seconds would be almost worthless. A volume of 5 to 8 cubic feet at a pressure of 40 to 50 lb. requires a fair sized compressor discharging air into a tank. Tanks range in size from two-gallon to sixty-gallon capacities. In almost every installation where there is continuous spraying, pressure feed tanks provide the most practicable and economical method of feeding air to the spray gun. With this system the flow of material is more positive, uniform, and in greater volume than with any other method.

Compressors are usually driven by electric motors. A portable compressor capable of delivering 5 cubic feet of air per minute can be operated by a ¾ h.p. motor but one horsepower is recommended. A check valve, pressure switch, and pressure release are standard equipment on compressors which discharge air into a tank. The entire assembly — compressor, motor, and accessories — can be purchased for less than $225.

The Spray Gun

Another and equally important piece of equipment is a good spray gun. When complaints are heard concerning the effectiveness of spray equipment the difficulty usually can be traced to the use of a very inadequate spray gun. No difficulty need be encountered in the selection of this item and there are definite standards below which good equipment cannot be purchased. One trial and comparison of the results obtained with an adequate spray gun and those obtained with an inferior type would instantly convince anyone that it is wise to buy a spray gun of superior design and manufacture. In the discussion emphasis is put on the types of spray guns

(Continued on page 39A)

Get these Training Aids, Free!

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Brown & Sharpe

Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH GRINDER
BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
BITS
- *a*) Auger, ¼ in. to 1 in. by 16ths
- *b*) Auger, $1\frac{11}{16}$ in., 18 in. long
- *c*) Drill, for wood, square shank, ⅛ in. to ½ in. by 16ths
- *d*) Expansion
- *e*) Extension, 18 in.
- *f*) Screw driver, ¼ in.

BLACKBOARD — permanent or portable
BLOWTORCHES — 1-qt. size
BOOKCASE
BRACES — ratchet type, 8-in. swing
BULLETIN BOARD
CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.
CHAIRS — teacher's and tablet arm
COMPASS SAW
COIL
- *a*) Spreader
- *b*) Taper
- *c*) Winder

DESK — teacher's, with drawer compartments
DRILL
- *a*) Breast
- *b*) Concrete, ⅜ in., ½ in., ¾ in., 1 in.
- *c*) Hand
- *d*) Portable, electric
- *e*) Twist, 1/32 in. to ⅜ in. by 32nds

DRILL PRESS
- *a*) Bench, hand, or power driven
- *b*) Heavy, power driven

FILES
FIRST-AID CABINET AND SUPPLIES
HACK SAW
- *a*) Blades, 10 in., 24 tooth
- *b*) Frames adjustable

HAMMERS
- *a*) Claw, 12 oz.
- *b*) Machinist's, ball peen

HICKEY — ½ in. and ¾ in.
LATHE
- *a*) Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
- *b*) Speed

PLIERS
- *a*) Gas, 6½ in. and 8 in.
- *b*) Side cutting, 6 in.

PUNCH — for metal molding
PUNCHES — assorted
REAMERS
- *a*) Pipe burring, ¼ in. to 1 in.
- *b*) Pipe burring, ½ in. to 2 in.

RULES
- *a*) 48 in. zigzag
- *b*) 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.
SHEARS — for cutting metal molding
SOLDER DIPPERS
SOLDERING COPPERS
- *a*) Assorted
- *b*) Electric
- *c*) Handles

STOCKS AND DIES — for Pipe threads, ½ in. to 1 in.
VISES
- *a*) Machinist's, 4 in.
- *b*) Pipe

WRENCHES
- *a*) Adjustable, 6 in. and 8 in.
- *b*) Pipe, 10 in., 12 in., and 14 in.
- *c*) Socket, combination

Electrical Shop — Supplies

ABRASIVE CLOTH — Aluminum oxide, 1, 1½, and 2 in. wide
ARMORED CABLE
- *a*) 2 wire, No. 14, single strip
- *b*) 3 wire, No. 14, single strip
- *c*) Box connectors

ATTACHMENT PLUG
BAR HANGERS
BATTERIES — dry cells
BATTERY ACID — 1.300
BATTERY SEALING COMPOUND
BOX CLEATS
BRADS — ¾ in., No. 19, and 1½ in., No. 16
BRAKE LINING — ¼ by 2 in.
BRUSHES — Carbon, for motors and generators
BURGLAR CONTACTS
- *a*) Open circuit
- *b*) Closed circuit

BUSHINGS
- *a*) Loom, No. 1 and No. 2
- *b*) "Jiffy" loom No. 2

BUZZERS
CLEATS — unglazed porcelain, 2 wire
CLIPS — test, with insulators, Universal, Nos. 22, 23, 24, and 25
COMMUTATOR CEMENT
CONDUIT
- *a*) Bushings, ⅛ in., ¾ in., and 1 in.
- *b*) Box connectors, for flexible
- *c*) Couplings, for flexible
- *d*) Lock nuts, ½ in., ¾ in., and 1 in.
- *e*) Rigid, ½ in., ¾ in., and 1 in.

CONDULET
- *a*) Fillings, ½ in., LL, LR, and LB
- *b*) Covers, ½ in., blank

DOOR OPENERS — mortised
FISH PAPER — .0125 in. thick
FIXTURES — brass chain, suspension
FIXTURE STUDS
FUSES
- *a*) Plug type, renewable, 125 volt, 15 amp.
- *b*) Cartridge type, renewable, 125 volt, 30 amp.
- *c*) Renewals for plug fuses
- *d*) Renewals for cartridge fuses

GROUND CLAMPS — ⅜ in. to 1 in., assorted
HICKEY GRIPS — ½ in. and ¾ in.
LAMPS
- *a*) Carbon, 220 volt, 60 watt
- *b*) Mazda, selected as wattages and voltages
- *c*) Guards for brass sockets

LEATHER NAIL HEADS
LUGS — 25 and 50 amp.
LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides
MOLDING
- *a*) Metal
- *b*) Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing
NUTS — iron, 4-36, 6-32, 8-32, 10-24, 12-24, 10-32, 14-20
OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening
PIPE STRAPS — galvanized, ⅜ in., ½ in., ¾ in., and 1 in.
PUSH BUTTONS
- *a*) Return call, 3 point
- *b*) Single

RECEPTACLES
- *a*) Flush, duplex
- *b*) Porcelain cleat, 660 watt, 250 volt
- *c*) Concealed
- *d*) Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
RELAYS — Dixie
RESISTANCE BOARDS — for testing
RESISTANCE UNITS — 125-ohm
RHEOSTATS
- *a*) Compression, 275 watt
- *b*) Field, for shunt and compound motors

ROSETTES — wood
ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.
SCREWS
- *a*) Anchors, 8/32, 10/24, 12/24, 14/20
- *b*) Machine, roundhead, 4-40 by ¼ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ⅜ in., 8-32 by ½ in., 8-32 by 1 in., 10-32 by ⅜ in., 10-24 by ⅜ in., 10-24 by ¾ in., 10-32 by ¾ in., 12-24 by 1 in.
- *c*) Machine, brass, roundhead, 4-40 by ¼ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ½ in.
- *d*) Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
- *e*) Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red
SOCKETS
- *a*) Brushed, brass pull chain, keyless, key
- *b*) Porcelain, keyless, with caps
- *c*) Porcelain, key, with caps

SOCKET CAPS — ¼ in. and ⅜ in. bushed
SOLDER WIRE — 50/50, size No. 10
SOLDERING PASTE — 2 oz. cans, noncorrosive
SOLDERING SALTS — 1-oz. cans, noncorrosive
SPEED COUNTERS — 0-9999
SPLIT KNOBS — porcelain
SPRING BALANCES — 0-30 lb.
STARTING BOXES
- *a*) For compound motors, various makes
- *b*) For shunt wound, 1 h.p., 110-volt motors. Overload release
- *c*) For shunt wound, 1 h.p., 110-volt motors. No voltage release
- *d*) Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt
SWITCH
- *a*) Battery, 4 point
- *b*) Bases, porcelain, for 10-amp switches
- *c*) Boxes, 2¾ in. deep
- *d*) Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
- *e*) Entrance, safety, 3 pole, 30 amp., 250 volt
- *f*) Flush, push button, S.P., D.P., 3 way, 4 way
- *g*) Surface, S1, S3, and S4
- *h*) Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
- *j*) Surface, snap, electrolier
- *k*) Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required
TACKS — double-pointed No. 10
TAPE
- *a*) Friction, ½-lb. rolls
- *b*) Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays
TELEPHONES
- *a*) Complete bridging, independent phones
- *b*) Couch vestibule telephones
- *c*) Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
- *a*) Bell ringing, 6, 8, 14 volt
- *b*) Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 9/16 by 10 in.
TUBING — flexible nonmetallic, ¼ in. and ⅜ in.
WASHERS
- *a*) Iron, ¼ in. and ⅜ in.
- *b*) Brass, ¼ in. and ⅜ in.

WIRE
- *a*) Annunciator No. 18 or No. 20
- *b*) Fixture, No. 18, single yellow, with marker
- *c*) Rubber covered, solid copper, No. 10, black
- *d*) No. 10, white
- *e*) No. 14, black
- *f*) No. 14, white
- *g*) Rubber covered, No. 16, brewery cord
- *h*) No. 18, lamp cord, green and yellow
- *j*) S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equipment

ANNUNCIATORS
- *a*) Automatic needle drop
- *b*) Gravity drop
- *c*) Manual needle drop

ARMATURES — burnt out, for repairing

(Continued on page 34A)

Dependable...Rugged INSTRUMENTS

for electrical and electronic instruction

Standardize on WESTON instruments throughout your electrical courses, and thus be sure your students are thoroughly familiar with the instruments they will use all through their working careers. Accurate, economical, rugged and dependable—types available for all laboratory and classroom needs. Literature on request. WESTON Electrical Instrument Corporation, 633 Frelinghuysen Avenue, Newark 5, New Jersey.

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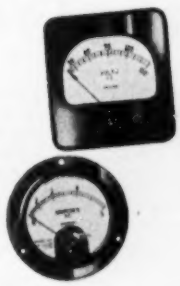
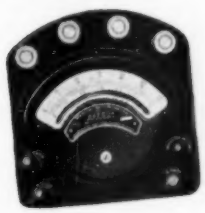
Weston offers the broadest line of panel and switchboard instruments in all the required types, sizes and ranges—including d-c, a-c power frequencies and radio frequency, rectifier types, and DB meters.



D-C MINIATURE INSTRUMENTS

Single and multi-range voltmeters, ammeters, voltammeters available. Accuracy within 1%. Hand calibrated scales. Knife-edge pointers, mirrored scales eliminate parallax errors.



Model 280

CLAMP VOLT-AMMETER

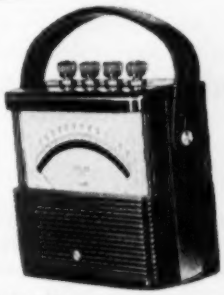
Provides 5 full scale a-c current ranges 1000/-250/100/25/10 amperes. Three self-contained a-c voltage ranges 700/350/-175 volts. Convenient 6 position thumb operated switch. Built to highest standards of safety and dependability.

A-C MINIATURE PORTABLE INSTRUMENTS

Available as Voltmeters in double and triple range combinations—Ammeters in ranges from 1 ampere to 30/5 amperes (higher ranges by using Model 539 current transformer with 1 ampere instrument).

D-C PORTABLE INSTRUMENTS

Highly shielded single and multi-range voltmeters, ammeters, milliammeters and microammeters. Temperature compensated . . . hand calibrated mirror scales. Accuracy within ½ of 1%.



Model 931

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Available with or without base. Widely used in school instruction where dependability and low cost are paramount. Sensitivity: 22 microamperes. Resistance: 23 Ohms. Scale: 30-0-30. Medium and extreme sensitivity models also available.

Model 375

D-C MINIATURE PORTABLE INSTRUMENTS

Rugged, serviceable for all-around use. Available in single, double, and triple ranges for voltage measurements; single and double ranges for current measurements. Accuracy 2%.

Model 489

WESTON INSTRUMENTS

(Continued from page 32A)

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
- *a)* Air, single pole, overload, 25 amp., 550 volt
- *b)* Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
- *a)* For multiple-speed motor
- *b)* For 1 h.p., 110-volt series motors

GENERATORS
- *a)* Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
- *b)* Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
- *c)* Auto generators of different makes

GRAVITY CELLS

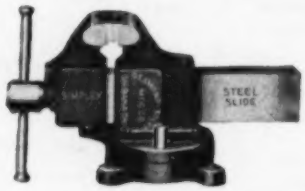
MAGNETS — testing, 10,000 ohm

METERS
- *a)* Ammeter, standard, 60 amp., a.c.
- *b)* Ammeter, standard, 60 amp., d.c.
- *c)* Ammeter, student, 60 amp., a.c.
- *d)* Ammeter, student, 60 amp., d.c.
- *e)* Voltmeter, standard, 0–10 volt, d.c.–a.c.
- *f)* Voltmeter, standard, 110–220
- *g)* Voltmeter, standard, 125 volt
- *h)* Voltmeter, standard, 125 volt, d.c.
- *j)* Voltmeter, student, 110 volt, d.c.
- *k)* Voltmeter, student, 110 volt, a.c.
- *l)* Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.–a.c.
- *m)* Wattmeter, student, 110–220 volt, 30 amp., a.c.–d.c.
- *n)* Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
- *a)* Auto starter, different makes
- *b)* Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
- *c)* Compound, 1 h.p., 110 volt, d.c.
- *d)* Multiple speed, 1 h.p., 3 phase, 220 volt
- *e)* Series, 1 h.p., 110 volt, d.c.
- *f)* Shunt, 1 h.p., 110 volt, d.c.
- *g)* Split phase and repulsive, a.c., 110 volt, single phase, assorted
- *h)* Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
- *j)* 3 phase, 1 h.p., a.c., 220 volt, various makes
- *k)* 3 phase, 2 h.p., 220 volt, a.c., various makes
- *l)* Universal, fractional h.p., 110 volt, different makes
- *m)* Universal, variable speed, ½ h.p.

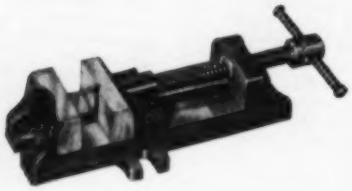
PLATFORM SCALE — 100 lb. capacity

the complete line of quality vises for school shops

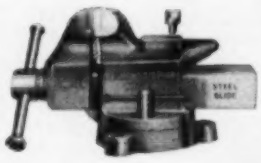


machinists vise

woodworkers' vise



milling machine vise



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PERSONAL NEWS

(Continued from page 6A)

Dr. Nelson, a veteran of World War II, joined the Stout faculty in September. He holds a bachelor of arts degree from Hamline University and a master of arts from the University of Minnesota, in addition to his newly confererd Ph.D.

♦ J. C. Woodin, Wichita, Kans., assumed the new title of assistant superintendent in connection with his duties in industrial and adult education on July 1. Formerly, his title was director.

♦ Leslie V. Hawkins, associate professor of industrial arts at Panhandle A. and M. College, Goodwell, Okla., received the doctor of education degree on August 8, 1953, from the Pennsylvania State College, State College, Pa.

♦ John L. Cermak, head of the industrial-arts department at Southwestern State College, Weatherford, Okla., was enrolled in Wayne University, Detroit, Mich., during the 1953 summer term. He began work on the Ed.D. degree.

♦ Wayne Thornhill is teaching industrial arts in Cherokee, Okla.

♦ Harold Roberts, formerly diversified occupations co-ordinator in Central High School, Oklahoma City, Okla., has secured a leave of absence to accept a position as the director of a new technical institute in Ethiopia.

♦ Royce Cornett, who taught at the Santa Ana Junior College, Santa Ana, Calif., joined the staff of the Long Beach State College, Long Beach, Calif., in mid-year last year. He teaches in the metalworking area.

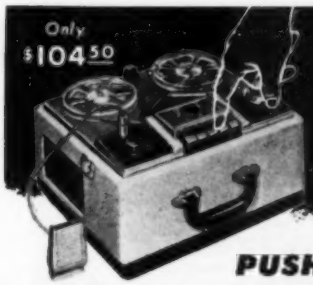
♦ Floyd Grainge joined the staff of the Long Beach State College, Long Beach, Calif., this fall and teaches in the areas of drawing and electricity. Mr. Grainge came to Long Beach State College from Ames, Iowa.

♦ Last year's graduates in industrial education from Long Beach State College, Long Beach, Calif., were placed in the following teaching positions: John Holmes, drafting, Chino, Calif.; Jerome Murphy, metalwork, Long Beach, Calif.; Donald Bower, automotive and drawing, Garden Grove, Calif.; Warren Ward, automotive, Bellflower, Calif.; Don Siriani, electricity, Santa Ana, Calif.; Dave Blackmer, Hawaii.

♦ Dr. William A. Sellon, formerly at Bradley University, Peoria, Ill., joined the industrial-arts staff at Ohio University, Athens, Ohio, on February 1, 1954.

♦ T. V. Downing, Virginia's assistant state supervisor of agricultural education, received an

(Continued on page 36A)



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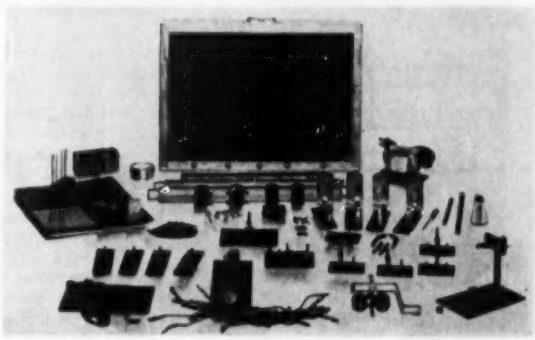
FOR TEACHING INDUSTRIAL ARTS ELECTRICITY

Use The New CROW Beginner's Experimental Kit



- **SAFE** – Uses only 6 Volt D.C. and A.C.; same as flashlight – no possibility of shock.
- **COMPLETE** – Comes with 240 page text-manual containing 319 illustrations.
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- **STUDENTS 'LEARN BY DOING'** – Construct their own operating assemblies.
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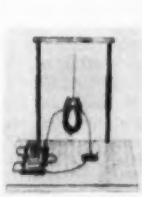
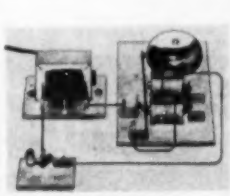
Experiments and assemblies cover:

Permanent Magnetism	**Bells**
Electro-Magnetism	**Buzzers**
Circuitry, switches, fuses	**Thermostats**
Induction and transformers	**Relays**
D.C. and A.C. electric motors and controls	

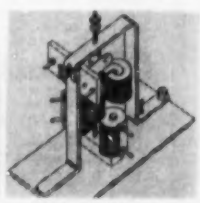
- **PRICE** – Complete with manual, transformer and portable case – – – – – – – – – – **$47.50**



Electro-Magnet Experiment



Bell Assembly and Circuit



Sketch of AC Motor Assembly

WRITE FOR ILLUSTRATED BULLETIN

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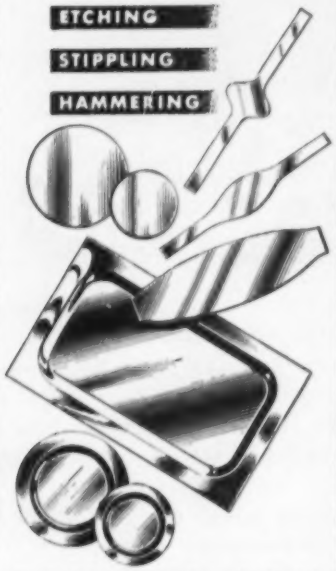

Students' metalcraft projects get the benefit of the best materials obtainable when you supply your classes with our Super-Brite MIRROR-Finish Aluminum and other specially-prepared craft metals. Available in circles (flat or preformed), in rectangles (flat or preformed), in bracelet blanks and other shapes . . . for etching, hammering, stippling and other treatments . . . in making trays, coasters, bracelets, medallions, pendants, plaques and many other beautiful and useful items . . . *Metal Goods Corporation craft metals are tops!*

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NON-ACID ETCHING AGENT

a boon to the craft instructor

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PERSONAL NEWS

(Continued from page 34A)

American Forestry Association's Annual Conservation Award at the Fourth American Forest Congress.

♦ BEN E. HARRIS retired after 25 years of service as Alabama's associate state supervisor of T. and I. education, and associate professor at the University of Alabama.

♦ C. M. MILLER resigned as director of the Kansas state board of vocational education, effective January 15, 1954. He will be 70 years of age four days before the date of his resignation.

He has headed the Kansas department since it was organized in 1922.

♦ M. B. ROTNEM is instructor of electricity and radio at the high school in Evanston, Ill.

♦ WILLIAM JOHN HORNBECK is educational supervisor of the Chrysler Corporation in Detroit, Mich.

♦ ROBERT S. GOMSRUD is head of the industrial-arts department of the Glenwood Public Schools, Glenwood, Minn.

♦ BRUCE THOMPSON teaches general metals at the high school, Salem, Ore.

♦ GORDON OAS teaches general metals in the Tappan Intermediate School, Detroit, Mich.

♦ RICHARD F. STOLL has been appoined executive secretary of the MTM Association for Standards and Research, which moved its laboratory facilities on September 1 from Pittsburgh to the University of Michigan. The Association was formed in 1951 to make research studies in the field of work measurement.

MTM President Seth Winslow, A. T. Kearney & Company, Chicago, announced that Stoll, now studying for his doctorate at the University, will supervise the downtown Ann Arbor offices of the Association, a nonprofit organization sponsored by industrial companies, consulting firms, and university professors.

In its new affiliation with the University's Engineering Research Institute, the Association will expand its research activities in the field of work measurement, Winslow said. The diversification of industry in the area surrounding the University will provide ideal experimental grounds for study of manual motions and operations that will be made by the MTM research staff together with University professors and graduate students.

♦ MARTIN GONSER has been employed to teach welding and machine shop at the University of Oklahoma. He formerly taught in Leavenworth, Kans., and has been working on a doctor's degree at Bradley University.

♦ PAUL ESHELMAN, assistant professor of industrial arts at the State Teachers College at Millersville, Pa., has recently completed his term of two years as president of the Pennsylvania Guild of Craftsmen. During the past year he has held a private show in the Galleries of America House, New York City, and has served as a member of the jury of the Pittsburgh show of the Associated Hand Weavers, and at the Southern Highlands Craft Fair, in Asheville, N. C.

He has had examples of his woodwork accepted in the arts and crafts show, Wichita Museum, Wichita, Kans., and the "Crafts of Massachusetts" shown at the De Cordovia Museum, Lincoln, Mass.

At the 1952 Craft Fair of the Pennsylvania Guild of Craftsmen he won the Anne Mueller Prize for the "Best of the Show"; received second prize for wood turning in the Regional Craft Show at the Art Alliance, Philadelphia, and first prize for wood turning at the Summer Crafts Festival, Sarasota Foundation, Sarasota, Fla.

He has demonstrated and lectured at the Worcester (Mass.) Art Museum, and at Old Sturbridge Village, Mass. — *Burl N. Osburn.*

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SIGNAL TRACER
and
CODE OSCILLATOR

- ABSOLUTELY NO KNOWLEDGE OF RADIO NECESSARY
- NO ADDITIONAL PARTS NEEDED
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WHAT THE PROGRESSIVE RADIO "EDU-KIT" OFFERS

The "Edu-Kit" offers a Technicians' Course at a rock-bottom price. The student learns how to identify Radio Symbols and Diagrams; how to build radios in a Professional manner by regular soldering and wiring techniques and not confusing clip-on methods. The student learns how to operate Receivers, Transmitters, and Audio Amplifiers. He learn how to service and trouble-shoot radios. He learns Code and receives training for F.C.C. License.

PROGRESSIVE TEACHING METHOD

It is not necessary that the student have even the slightest background in Radio or Science. The "Edu-Kit" is used by Radio Schools and Clubs; by Armed Forces Personnel and Veterans for training and rehabilitation. The Instructions are complete, simple, and clear. The student cannot make a mistake.

The "Edu-Kit" uses the principle of "LEARN BY DOING." The student builds radios, and performs jobs and conducts experiments to illustrate the principles which he learns. He begins by learning the function and theory of each of the radio parts. Then he builds a simple radio. Gradually, in a progressive manner, he constructs more advanced multi-tube sets. These sets operate on 105–125 Volts AC-DC.

The Progressive Radio "EDU-KIT" Is Complete

Every part necessary to build fifteen different radio sets is included. Our Kits contain tubes, tube sockets, chassis, variable condensers, electrolytic condensers, paper condensers, mica condensers, resistors, line cords, selenium rectifiers, tie strips, coils, hardware, tubing, etc. A Soldering Iron is included as well as an Electrical and Radio Tester. In addition, the "Edu-Kit" contains lessons for servicing with the Progressive Signal Tracer, F.C.C. instructions, Quizzes. The "Edu-Kit" is a complete course down to the smallest detail.

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• Electrical and Radio Tester • Electric Soldering Iron • Book on Television • Radio Trouble-Shooting Guide • Quizzes • Training for F.C.C. License.

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All new, flat, paper masked Plexiglas in the best colors. Finest quality in mixed sizes and thicknesses. Size 6" x 12" and larger.

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Assortment includes translucent, opaque and transparent reds, blues, greens, greys, whites and others.

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AMERICA'S LARGEST PLASTICS SUPPLY HOUSE

CLIP THIS TO GET—

FILMSTRIPS IN COLOR for WOOD SHOPS

McKnight and McKnight now offers a new set of *six full colored* film strips to supplement the instruction in wood shops. Fifty frames to each film strip. The information supplied through these film strips does not duplicate any printed material and is intended to enrich the student's knowledge, stimulate his interest and encourage a better understanding of forest conservation, good design and shop safety. Teacher guide with each set of six strips.

1. Lumbering of Hardwoods, *directed by Ivan Hostetler*
2. Processing Hardwoods, *directed by Ivan Hostetler*
3. Finishing I, *directed by George Soderberg*
4. Finishing II, *directed by George Soderberg*
5. Safety, *directed by John Hurley*
6. Design, *directed by Richard Wiggins*

Set of 6 strips in Full Color (boxed)... $31.50

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Send me FILM STRIPS FOR WOOD SHOPS for FREE 10 DAY TRIAL. I will either return them in 10 days and owe nothing — or send you $31.50 in full payment.

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City.....Zone.....State.....

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REMEMBER THE NAME ... Rubyfluid

the easy-to-use Soldering Flux for neat strong unions.

Use Rubyfluid Flux — liquid or paste — to get neat, strong unions speedily and easily. Rubyfluid is a special fast acting formula, wets out freely, is free from harmful and objectional fumes, economical to use. Try it — send $1 for special offer — 1 pt. liquid, ½ lb. paste flux and helpful booklet.

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Here are 65 examples of projects that your students can make in Industrial Arts and Industrial Education classes. They're conveniently classified into the 14 divisions open to Industrial Arts Awards entries.

The new Industrial Arts Awards Foto File serves *two* purposes. It's an actual teaching tool for your classroom—and an "idea file" to get your students started on original projects of their own.

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B

SPRAY EQUIPMENT

(Continued from page 31A)

which are in common use and an effort is made to explain why difficulties arise and how to avoid them. Spray guns are of the following types:

1. Attached container or separate container.
2. Bleeder or nonbleeder.
3. External or internal mix.
4. Pressure, gravity, or suction feed.

Type No. 1 may have a metal or glass container which clamps on or is screwed into a cap which is attached to the gun. Containers may have capacities of one half pint, pint, or quart of liquid. This arrangement is very satisfactory for spraying where frequent changes of material are necessary. Several containers may be at hand and the change from one material to another can be made in less than a minute. If the container is not attached to the gun it would be one of the types described in No. 4 in that which follows.

The bleeder type gun has little to recommend it and has probably caused more spraying difficulties than all other sources combined. Small compressors are frequently made without air tanks or adequate pressure controls. If the compressor were allowed to operate and no air escape were provided the pressure would soon burst the hose. An intentional air leakage is therefore provided, usually at the spray head of the gun, but frequently through a simple pressure release on the compressor. The continual rush of air from the spray head of the bleeder gun dries or coagulates some finishing materials at the spray head and partial stoppage may result. The opening in the spray head of a bleeder gun is often nothing more than a slot while in guns of better design the liquid leaves the gun in a cone-shaped spray. The operator has little control of the shape of the spray pattern of a bleeder gun. These guns produce a film marred by excessive orange peel. The heavier liquids are not sufficiently atomized and at each manipulation of the trigger the gun may eject one or more large drops of material which may cause a *run* on the surface. A bleeder gun is a constant source of annoyance and is not worth its cost even if the cost is very low.

The nonbleeder type gun is the standard industrial type. This gun is used in systems where the compressor builds air pressure in a tank. When the gun trigger is released a valve shuts off the entire flow of air and spraying liquid. The tank is equipped with a pressure control. With this gun there is no difficulty caused by a constant flow of air and pressure is built up in the tank for future use. The mechanism of the nonbleeder gun is superior to that of the bleeder type and it gives excellent control of the spray pattern.

There is a choice between the external mix air cap in which air and fluid are mixed as they leave the cap and the internal mix in which air and fluid are mixed inside the gun. The external mix is highly recommended and is preferred because of the greater degree of control of the spray pattern and material. When the sprayman is using an external mix gun and wishes to change from one type of spraying liquid to another he needs only spray a little thinner or cleaning solvent through the gun and may then begin spraying the new material. When an internal mix gun is used and a change of

(Continued on page 47A)

Sheldon FURNITURE

IS EDUCATIONALLY CORRECT

You can have a shop tailored to your needs . . . fine units, thoughtfully dovetailed into efficient patterns to set up your heaviest schedule. You'll find your classes run smoother because there's a place for everything, uncluttered, easy to keep in order. And every Sheldon piece glorifies craftsmanship, design-to-a-purpose, full space use. A Sheldon shop is educationally correct.

E. H. SHELDON EQUIPMENT COMPANY
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Sheldon FURNITURE

FOR HIGH-SCHOOL SHOPS, LABORATORIES, HOMEMAKING ROOMS, AND STUDIOS

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
- a) Coke
- b) Foundry
- c) Scrap

BELT LACER
BENCHES
- a) Coremaking
- b) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¼ in. to 2½ in. thick
- c) Molding

BLACKBOARD — permanent or portable
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — Teachers', and tablet arm if needed for related-subjects room, or for demonstration section
CHUCK
- a) Drill, selected sizes
- b) Lathe, combination, 4 jaw, selected sizes
- c) Lathe, independent, 4 jaw, selected sizes
- d) Lathe, universal 3 jaw, selected sizes
- e) Milling machine, universal

CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand, of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
- a) Bench, hand
- b) Breast
- c) Electric, portable
- d) Hand
- e) Post, hand or power
- f) Radial
- g) Sensitive
- h) Upright, power

FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
- a) Annealing
- b) Bench
- c) Brass and soft metal
- d) Combination bench
- e) Casehardening
- f) Cyanide
- g) Gasoline
- h) Heat-treating
- j) Melting

GEAR-CUTTING MACHINE
GRINDER
- a) Bench, hand or power driven
- b) Combination grinder, buffer, and polisher
- c) Emery, bench or pedestal type
- d) Face, with magnetic chuck
- e) Portable tool post
- f) Precision, for external and internal grinding
- g) Universal tool cutter, drill and reamer grinder
- h) Wet tool

HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
- a) Automatic
- b) Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
- c) Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
- d) Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
- e) Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
- f) Turret
- g) Metal spinning

MILLING MACHINE
- a) Plain, cone or motor-driven type
- b) Universal, cone or motor-driven type

NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
- a) Counter for machine shop
- b) Platform, for foundry, 1000-lb. capacity

SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
- a) Blacksmith
- b) Drill press
- c) Machinist
- d) Pipe
- e) Planer
- f) Shaper

WELDING OUTFIT
- a) Acetylene
- b) Electric

Metalworking — Small Tools

ARBORS
- a) Drill chuck to suit requirements
- b) Reamers, various sizes
- c) Shell tool, various sizes
- d) Straight shank for shell reamers and shell drills, selected sizes
- e) Taper shank for shell reamers and shell drills, selected sizes

BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
- a) Bench
- b) Core box
- c) Core painting
- d) Hard brushes for foundry
- e) Floor
- f) Soft brushes for foundry

BULB SPONGES — for molders
CAKE FORKS — for foundry
CALIPERS
- a) Hermaphrodite, 4 in. and 6 in.
- b) Inside, 4 in. and 6 in.
- c) Outside, 4 in. and 6 in.

CANS
- a) Oil, ½ pt., 1 pt., and 10 gal.
- b) Waste

CENTER TESTERS
CHISELS
- a) Cape, 3/16 in. and 3/8 in.
- b) Cold, 5/16 in. and ¾ in.
- c) Diamond point, 3/16 in. and ½ in.
- d) Roundnose, 3/16 in. and ½ in.

CLAMPS
- a) 4 in., 6 in., 8 in., and 10 in.
- b) Flask, for foundry
- c) Strap, various sizes

COLLETS
- a) For milling machine, selected sizes
- b) For lathe, selected sizes.

COMBINATION SQUARES — with hardened head and blade, and protractor head, 9 in. and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
- a) Shanks, single end to fit ladles
- b) Shanks, hand, to fit ladle bowls

CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal slitting

DIVIDERS — Spring, 4 in. and 6 in.
DRAW PINS — for molders
DRILLS
- a) Drifts, different sizes
- b) Sleeves, different sizes
- c) Stand for Nos. 1 to 60
- d) Stand for 1/16 in. to ½ in. by 64ths

DRILLS
- a) Center
- b) High speed, taper shank, various sizes
- c) Jobbers, straight shank, 1/16 in. to ½ in. by 64ths
- d) Ratchet
- e) Straight shank, Nos. 1 to 60
- f) Taper shank, ½ in. to 1 in. by 16ths

FILE CARDS
FILES
- a) Die sinkers, various shapes
- b) Flat bastard, 8 in., 10 in., 12 in., and 14 in.
- c) Half round, double cut, 6 in., 8 in., 10 in., and 12 in.
- d) Hand, smooth, 8 in., 10 in., and 12 in.
- e) Mill, smooth, 8 in., 10 in., and 12 in.
- f) Round bastard, 8 in., and 10 in.
- g) Square bastard, 8 in., and 10 in.
- h) Swiss, various shapes
- j) Three-square, double cut, 6 in.
- k) Warding, double cut, 6 in.

FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple for foundry
GAUGES
- a) Center
- b) Depth
- c) Drill and wire
- d) Screw pitch, select kinds
- e) Surface
- f) Thickness

GLOVES — asbestos, for foundry
GOGGLES
- a) For machine shop
- b) For foundry

HACK SAW
- a) Blades, hand, 18T, 10 in.
- b) Blades, power, 14T, 12 in.

(Continued on page 42A)

Cincinnati Training Aids

FOR YOUR SCHOOL SHOP PROGRAM

Chances are, the students you train today will be operating or supervising the operation of Cincinnati Milling, Grinding or Cutter Sharpening Machines tomorrow. That's why instructors find Cincinnati training aids of invaluable assistance. With these booklets and diagrams, students quickly grasp the fundamentals of machining and become familiar with the function and location of various units and controls of the machines. Copies will be sent to instructors free on request. Or they are available in quantities at a modest charge.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED
(Subsidiary of The Cincinnati Milling Machine Co.)
CINCINNATI 9, OHIO

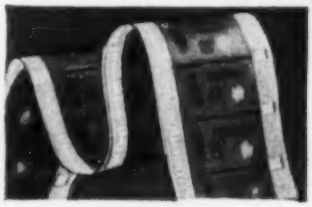
INSTRUCTION CHARTS

of the type illustrated here will be sent to school shop instructors on request. The diagrams, enlarged photos indicating the principal units and controls, are useful for classroom discussions. They are available for the following machines:

- *No. 2ML and 2MI Milling Machines*
- *No. 2 Cutter and Tool Grinder*
- *12" Hydraulic Universal Grinder*
- *No. 2 Centerless Grinder*

THREE 16 MM COLOR MOVIES

"Highway to Production," "Age of Precision," and "Cool Chips" are available. Technically these three movies are not training aids, but they are widely used, highly informative, and give the students a greater appreciation of the machine tool and metalworking industries. Write for booking dates.



EDUCATIONAL BOOKLETS

on various phases of metalworking and shop practice are a big help to the instructor. The more popular ones are tabulated below:

- *Milling Machine Practice*.....*No. M-773-1*
- *Cutting Gear Teeth*.....*No. M-1769*
- *Look Sharp at Your Cutters*.....*No. M-1657-3*
- *Principles of Centerless Grinding*.....*No. G-503-2*
- *Explaining the Centerless Principle with the Aid of a Wood Model*.....*No. G-509*

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

(Continued from page 40A)

c) Frames, adjustable
HAMMERS
a) Babbitt
b) Ball peen, 13 oz., 16 oz., or 20 oz.
c) Blacksmith's, various kinds
d) Riveting, 9 oz., and 12 oz.
e) Setting
INDICATOR
a) Center
b) Universal or universal dial test
c) Speed
KNURLING TOOL — with assorted knurls
LADLES
a) Bull
b) Hand bowls
c) Melting
LATHE DOGS — ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in., and 3 in.
LEGGINGS — fireproofed duck, to protect students when pouring in foundry
LEVEL — 6-in. bench
LIFTING SCREWS — for molders
MALLETS — wood or soft
MANDRELS — selected sizes
MICROMETERS — inside, 1½ in. to 8 in.; outside, 0 to 1 in.; outside, 1 in. to 2 in.; outside, 2 in. to 3 in.
MOLDING BOARDS
MOLDING STICKS AND TROWELS — various kinds
NIPPERS — end cutting, 5 in.
OIL STORAGE TANK — with pump
OILSTONES — medium and fine
PAILS — galvanized, 12-qt. capacity for foundry
PARALLELS
a) Adjustable
b) Steel, assorted sizes
PLIERS
a) Combination, 6 in.
b) Side-cutting, 6 in.
PUNCHES
a) Center, ¼ in. and ⅜ in.
b) Hollow, ½ in., ¾ in., and 1 in.
c) Pin, ⅛ in., 5/32 in., 3/16 in., 7/32 in., and ¼ in.
d) Prick, ¼ in.
RAMMERS — for foundry
a) Hand
b) Floor
REAMERS — various sizes
a) Adjustable
b) Hand
c) Taper pin
d) With taper shank
RIDDLES — ¼-in. and ⅛-in. mesh, 18-in. diameter, for foundry
RIVET SETS — assorted sizes
SCALES
a) Steel, 6 in., graduated 1/64 in. to ½ in.
b) Steel, 12 in., graduated to 32nds
SCREW DRIVERS — 6 in. and 9 in. blade
SCRIBERS
SHOVELS
a) Coke
b) Sand
SNIPS — tin, 3 in. straight and 3 in. curved
SOCKETS — for taper shanks, drill and tools, selected sizes
SOLDERING COPPERS AND HANDLES — 1-lb. size
SPRAY CAN — for molders
SPRINKLING CANS — galvanized iron, 10-qt. capacity, for foundry
SPRUE PICKS — for molders
SQUARES
a) Machinist's, 6 in.
b) Blacksmith's
STEEL FIGURES — ⅛ in.
STEEL LETTERS — ⅛ in.
SWABS — for molders
TAPELINE — steel, 25 ft.
TAPS AND DIES
a) Machine screws
b) Pipe
c) N.F. ¼ in. to ¾ in.
d) N.C. ¼ in. to ¾ in.
TONGS
a) Blacksmith's, various kinds
b) Pick up, for foundry
c) Shake out, for foundry
TOOL HOLDERS
a) Boring tools
b) Cutting-off tools
c) Planer
d) R.H. and L.H. offset shank
e) Shaper
f) Slotter
g) Straight shank
h) Threading
TOOL-HOLDER BITS — square, ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.
TRAMMEL POINTS
V BLOCKS AND CLAMPS
WHEEL DRESSER
WRENCHES
a) Adjustable, 8 in. and 10 in.
b) Pipe, 8 in. and 12 in.
c) Tap, adjustable, various sizes

Metalworking — Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls from 1 to 28 in. wide
ABRASIVE WHEELS
ACETYLENE GAS — in drums for welding
ALUMINUM
a) Pigs for foundry
b) Sheets, tubing, rounds, shapes, wire, etc.
BABBITT METAL
BEARING BLUE
BELT DRESSING
BELT LACING MATERIAL
BELT LEATHER
BOLTS
a) Carriage, selected sizes
b) Lag, selected sizes
c) Machine, selected sizes
d) N.F., selected sizes
e) Stove, flat or roundheads, selected sizes
BRASS
a) Bars, 3/32 in., ⅛ in., 3/16 in., and ¼ in. thick; ¾ in. to 1 in. wide, 8 ft. to 10 ft. long, selected sizes
b) Round rods, 3/16 in. to ½ in. by 16ths, selected sizes
c) Sheets, 28 to 32 American gauge, 12 in. wide by 72 in. to 84 in. long, selected sizes

(Continued on page 44A)

Smoother Action...Larger Capacity...

on this Duro 26" Scroll Saw

Whether it's a simple jig saw project on ¼" plywood or a complicated scroll pattern on heavy 1¾" stock —you'll be amazed at the way this Duro Scroll Saw performs. Practically vibration and whip-free with a full vigorous cutting action — it actually purrs thru difficult work effortlessly. It's BIG yet handles easily and produces high quality "finished" work.

Here's what the "hidden" facts reveal: Has fully equalized blade tension which eliminates excessive blade breakage; precision balanced crankshaft, operates in oil bath; cuts to center of 52" stock; 15" x 15" machine cast iron table tilts to 45 degrees right and 15 degrees left; built-in sawdust blower; 4 step pulley provides speeds for all types of work; arm removable for saber work or bench filing; file chuck assembly for ⅛" and 3/16" shanks included plus many other features.

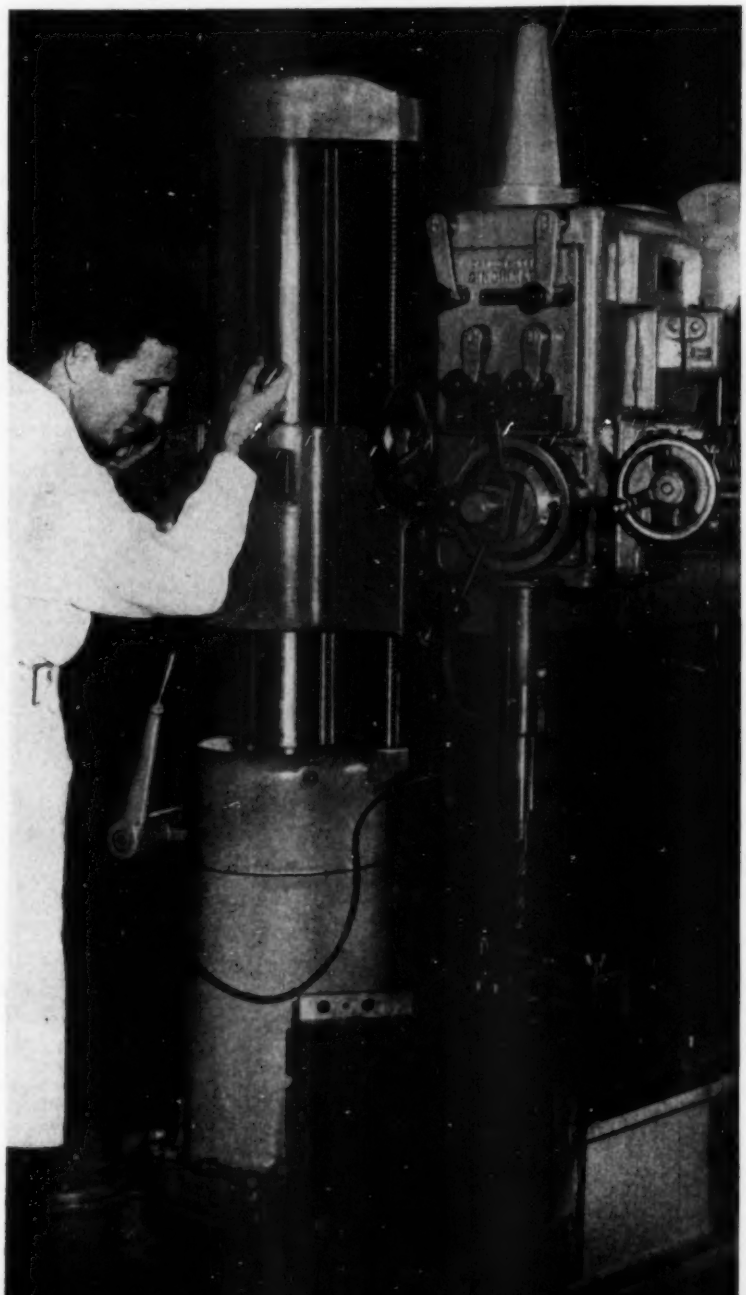
Write for Special Bulletin . . .

giving full details and specifications on this remarkable Duro scroll saw. Includes dimensions, weights, accessories available and prices. Write today.

Under table view shows heavily ribbed table construction and double trunnion mounting. Crankcase is firmly bolted to heavy cast iron base that also carries motor mount.

DURO METAL PRODUCTS CO. • 2671 N. Kildare Ave. • Chicago 39, Ill.

World's Largest Manufacturers of Power and Hand Tools (Duro-Chrome)



train them on the tools industry uses...

CINCINNATI
LATHES and DRILLS

Can he say, *"This tool is familiar"?*

Imagine him the first day on the job. Will geared-head lathes with a wide range of spindle speeds be familiar to him? Or will he look for a forest of jackshafts and belting? Will tolerances in tenths cause concern?

Or will he know it all from your school shop?

You can give your students a firm foundation with Cincinnati Lathes and Drills. The very same tools they'll find in production can be old friends to them. For surprisingly little more than you pay for "old-new" tools, you can equip a shop with Cincinnatis and measure the difference in finer curriculums and challenging shop projects.

Today... write, on your school letterhead, for catalogs, prices and the name of your local Cincinnati Lathe dealer. Cincinnati Lathe & Tool Co., 3212 Disney, Cincinnati 9, Ohio.

Projects in Metalworking

Written by
DONALD G. LUX
Instructor, Division of Industrial Education
**State University*

NEW 32 PAGE BOOK contains 12 projects to aid the Metalworking Instructor!

DI-ACRO BENDER NO. 1

DI-ACRO FINGER BRAKE

DI-ACRO ROLLER

This booklet is designed to illustrate projects which include in their construction common metalworking operations that are readily performed on the Di-Acro Machines best adapted for use in the school shop—Rollers, Brakes and Benders.

These Di-Acro Machines are versatile, are made in sizes which are suitable for the small school shop, and are of sound construction which should appeal to school shop instructors and supervisors. Complete information on Di-Acro Rollers, Brakes and Benders is contained in the booklet.

*Name on request.

TO THE INSTRUCTOR OR SUPERVISOR

A copy of the PROJECTS IN METALWORKING booklet is available to you free of charge. Request it on your school letterhead. Copies in classroom lots—25¢ each.

See Booth 76–77
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Los Angeles Mar. 23–26

O'NEIL-IRWIN MFG. CO.
331 Eighth Avenue
Lake City, Minnesota

di-acro PRECISION METALWORKING MACHINES

(Continued from page 42A)

d) Strips, 1/32 in. and 1/16 in. thick, 1/2 in. to 1 1/2 in. wide, 50 ft. to a coil, selected sizes
e) Threaded rods, Nos. 6 to 10, in 24 in. lengths. Nos. 12, 14, 1/4 in., and 5/16 in., in 24 in. lengths, selected sizes
f) Wire, soft, 8, 11, and 14 American gauge, selected sizes
g) Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS

CHAPLETS — single and double head

COAL
a) Charcoal for foundry or forge
b) Coke for foundry
c) Forge

COPPER
a) Pigs, for casting alloys
b) Sheets, 8 to 25 American gauge, 30 in. by 60 in., selected sizes
c) Tubing, outside diameters, 3/16 in., 1/4 in., 5/16 in., 3/4 in., 1/2 in.; thickness of wall, 1/32 in.; lengths, 8 ft. to 12 ft., selected sizes
d) Wire, soft, 2 to 20 American gauge, in coils. Also in 1/4, 1/2, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
a) Compounds
b) Flour
c) Paste
d) Oil
e) Wax-vent wire

CUTTING COMPOUNDS

FIREBRICKS AND CLAY — for foundry

FIRE HANDLES — assorted sizes

GRAPHITE — for foundry

IRON — pig, for foundry

LACQUER — transparent and colored, for finishing

NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds

OIL
a) Boiled linseed
b) Lubricating
c) Quenching and hardening

PACKING
Round, sheet, square, or tubular

PAINT — black asphaltum

PINS
a) Cotter, 3/32-in. to 1/4-in. diam. from 1/2 in. to 2 in. long
b) Flask, for flask repairs
c) Taper, Nos. 0 to 6, 3/4 in. to 2 in. long

PUMICE POWDER

RIVETS
a) Copper, with burrs, Nos. 7 to 14, lengths, 3/8 in. to 3/4 in., selected sizes
b) Iron, No. 14 gauge to 3/16 in., flathead or button head, 1/4 in. to 1 in. long, selected sizes
c) Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

SAND
a) Molding, in 350-lb. barrels or 800-lb. casks
b) Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
a) Flathead or roundhead iron brass, selected sizes and kinds
b) Cap and machine, iron or brass, selected sizes and kinds
c) Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire

SOLDERING PASTE OR SALTS

STEEL
a) Bessemer, rod, 1/64 in. to 3/8 in. by 64ths, in 4-ft. lengths, selected sizes
b) Bars, cold rolled, 1/8 in. to 3/4 in. thick, 1/2 in. to 2 in. wide, 12-ft. lengths, selected sizes
c) Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes
d) Rods, hexagon and square, cold rolled, 1/4 in. to 3/4 in., in 12-ft. lengths, selected sizes
e) Round, cold rolled, diameters 1/8 in. to 1 in., lengths 12 ft., selected sizes
f) Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in.
g) Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28 U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in., selected sizes
h) Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, 1/4 in., and 5/16 in., in 24-in. lengths, selected sizes

TIN
a) Pigs, for casting alloys
b) 1C, 1X, 20 by 48 in.
c) 1XX, 20 by 48 in.

WASHERS AND BURRS
a) Copper burrs, Nos. 3 to 14, in 1-lb. boxes
b) Iron burrs, Nos. 3 to 14, in 1-lb. boxes
c) Brass washers, 3/16 in. to 1/2 in. by 16ths
d) Iron washers, 3/16 in. to 1/2 in. by 16ths

WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)
a) Brazing, 1/16-in., 1/8-in., and 3/16-in. diameter
b) Cast aluminum, 3/16-in., 1/4-in., and 3/8-in. diameter
c) Cast brass, 3/16-in., and 3/8-in. diameter
d) Cast bronze, 1/4-in. diameter
e) Cast copper, 3/16-in. and 1/4-in. diameter
f) Cast iron, 3/16-in., 1/4-in., 5/16-in., and 3/8-in. diameter
g) Low carbon steel, 1/8-in., 3/16-in., and 1/4-in. diameter

WHITE LEAD — for machine shop

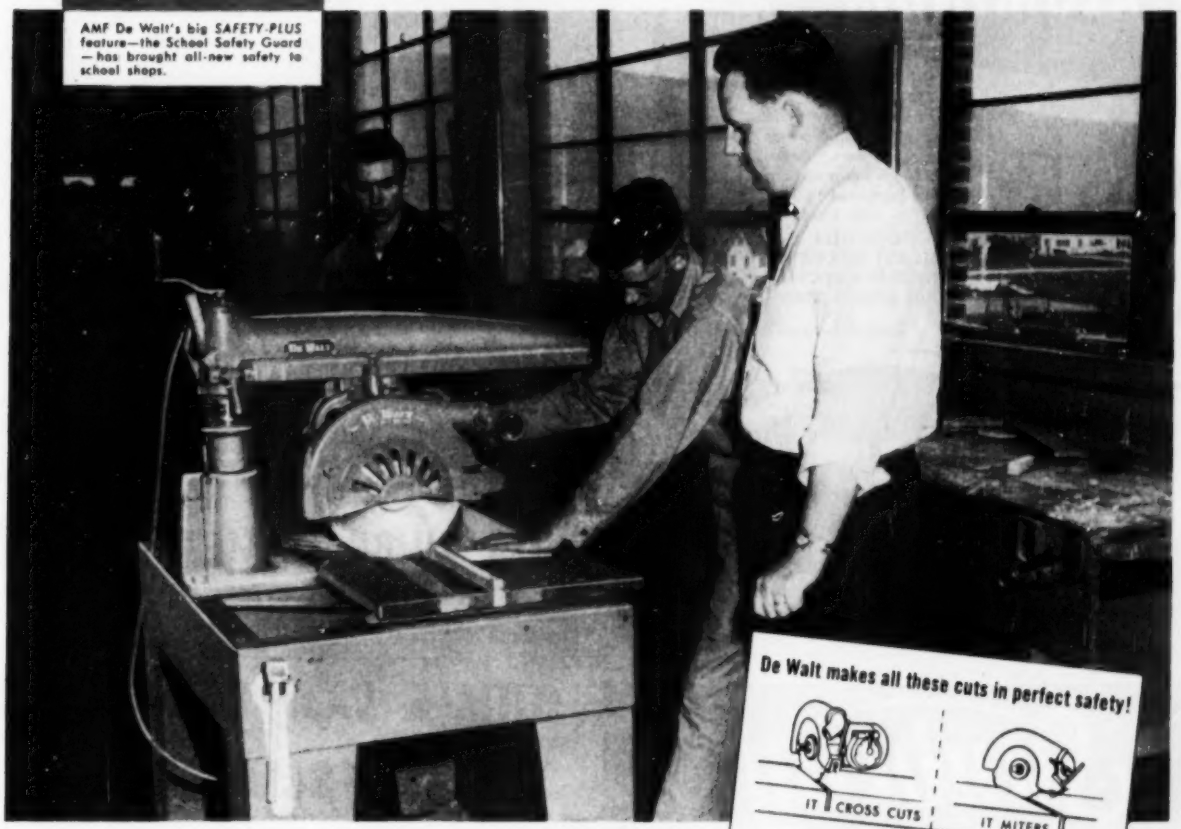
WIRE
a) Annealed, 16 to 34 W and M gauge, selected sizes
b) Coppered market, 5 to 18 W and M gauge, selected sizes
c) Coppered spring, 2 to 18 W and M gauge, selected sizes
d) Galvanized, 5 to 18 W and M gauge, selected sizes
e) Piano, Nos. 2/0 to 36, selected sizes
f) Tinned, 16 to 24 W and M gauge, selected sizes
g) Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

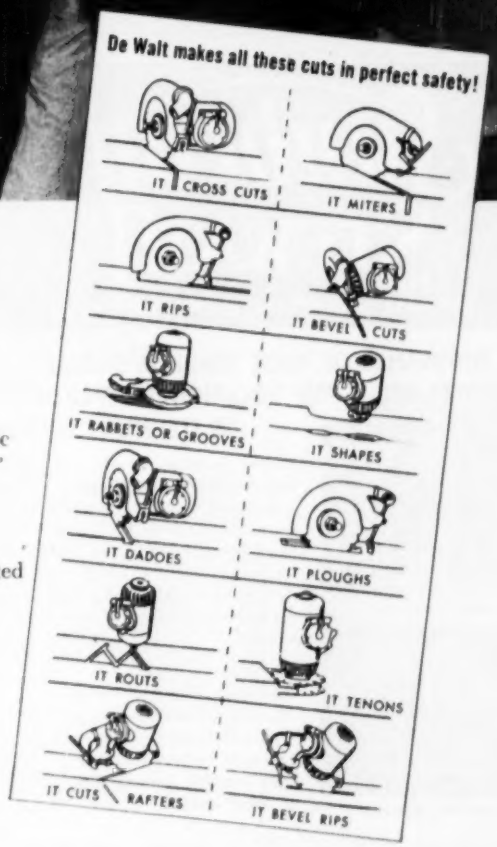
ZINC
a) Pigs, for casting alloys
b) Sheet, Nos. 4 to 14, sheets 36 in. by 84 in.

AMF De Walt's big *SAFETY-PLUS* feature—the School Safety Guard —has brought all-new safety to school shops.

"I'm really sold on AMF De Walt as a safe multi-purpose tool!"

says E. F. Wilson, Instructor, Vocational Agriculture Dept., George Wythe High School, Wytheville, Va.





"Like most instructors, I was wary about having my students work with a multi-purpose tool. But when I saw how safe AMF De Walt® is, I got one right away. Now my students can learn as many as 15 different operations.

"And I don't worry about their safety, thanks to features like AMF De Walt's Blade and Arbor Guard, Anti-kickback Device for all operations from ripping position and the new Automatic Safety Carriage Lock. That's why I'm really sold on AMF De Walt."

Yes, AMF De Walt is *safe* and *versatile*. What's more it's easiest to teach and learn. Makes all cuts quickly . . . accurately.

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DO IT YOURSELF ALUMINUM

REYNOLDS DO IT YOURSELF ALUMINUM

Engineered for use in your school shop . . . with ordinary wood-working tools.

DRILL IT | PLANE IT | BEND IT | CUT IT | SAW IT

Tubes • rods • bars • plain sheets • embossed sheets angles • fasteners • screen and storm window sections window hardware • plastic sheets • trim moulding.

STOCK SIZES
SMALL LOT QUANTITIES
WAREHOUSE SERVICE FOR YOUR SCHOOL SHOP

FREE BOOKLET!

New 16-page Do-It-Yourself booklet with complete plans, detailed drawings and many projects as illustrated . . . tells how to work Do-It-Yourself Aluminum with ordinary hand and power tools. Includes directions and illustrations for sawing, planing, drilling, bending and cutting.

Booklet and Price List of Do-It-Yourself Aluminum sent FREE on request. Write to

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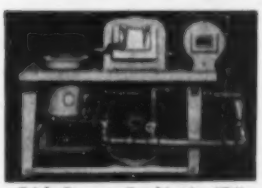
THE BEST INDUSTRIAL FURNACES MADE

THOUSANDS OF THESE SUNBEAM STEWART FURNACES ARE IN THE VOCATIONAL DEPARTMENTS OF TECHNICAL SCHOOLS



Triple Purpose Combination "D"

Triple Purpose Combination "E"

Because Sunbeam Stewart units have been designed for efficient production heat treating in small shops and tool rooms, they are widely recognized as standard equipment for all types of industrial heat treating and vocatidnal training work. To provide complete heat treating facilities for training purposes Sunbeam Stewart especially designed combination units, shown at left.

For student instruction and reference, write for free "Guide to Furnace Selection." Aids in determining the type of furnace best suited for any work. Also ask for Data File on school units.

SUNBEAM CORPORATION (Industrial Furnace Division)
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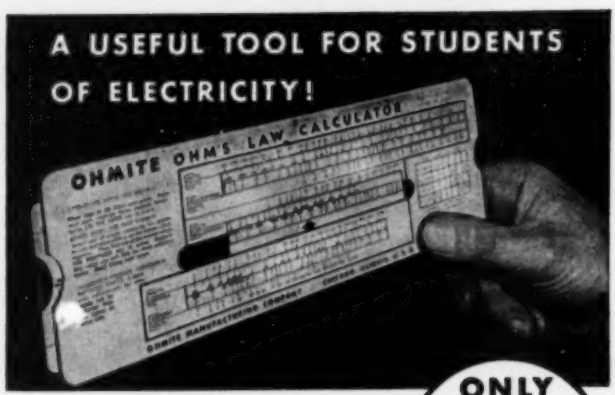
OHM'S LAW CALCULATOR AND SLIDE RULE

A USEFUL TOOL FOR STUDENTS OF ELECTRICITY!



ONLY 25¢
TEACHERS! ONLY 15¢ each in quantities of 25 or more

A time-saving calculator for your students after they have learned Ohm's Law. Solves Ohm's Law and many parallel resistance problems simply, quickly, accurately—with only one setting. Slide rule scales multiply, divide, find squares, square roots, etc. Only 9" x 3", heavy varnished cardboard, it fits handily into the pocket. Also available in durable vinylite at $1.50.

OHMITE MANUFACTURING CO. • 3656 Howard St., Skokie, Ill. (Suburb of Chicago)

SPRAY EQUIPMENT

(Continued from page 39A)

material is necessary the sprayman must take the gun apart and clean several parts and passages inside the gun. Purchase the external mix gun and avoid many annoyances.

Fluid finishing materials may be brought to the spray head of the gun by suction, gravity, or pressure. Gravity and pressure systems are usually employed by factories where large quantities of material must be sprayed in a continuous operation. In the gravity system the liquid to be sprayed is in a container above the level of the sprayman and is carried by gravity to the gun. When the pressure system is used the finishing material in an air-tight container is placed near the sprayman. When air pressure is introduced it forces the fluid through the hose and the gun.

Why Use an Air Transformer

An air transformer is a necessary device which condenses air, oil, or moisture and prevents undesirable materials in the air line from being blown from the compressor through the spray gun. The cost of a transformer varies from $20 to $50.

When a quart or less of fluid is to be sprayed the suction type gun performs admirably. The fluid is in a separate glass or metal container attached to the gun. As the trigger is pressed the air stream rushes around the fluid nozzle where air currents create sufficient vacuum to draw liquid from the container. Adjustments of the spray head produce a variety of spray patterns and simple adjustment of the fluid needle will control the fluid volume. This type of gun is highly recommended. A suction type spray gun of medium size, of standard make, equipped with a one-quart separate container, external mix air cap, 25 feet of $\frac{5}{16}$-in. inside diameter air hose and air transformer, can be purchased for less than $50.

The operation of a spray gun creates mist and fumes which are disagreeable. Very efficient air exhaust systems can be purchased but their cost is high. In some states and localities there are laws which govern the type and installation of exhaust systems. Where spraying is not continuous and where small articles are being sprayed much of this expense can be spared. Spraying should be done in a well-ventilated room. The sprayman should wear one of several approved types of respirators which will provide ample protection. An electric fan placed near an open window will force fumes and mist from a room. Here is a word of caution. It is wise to minimize strong air currents which flow over projects at the time they are being sprayed. Too rapid drying of any finishing film is likely to shorten its flowing time and increase the roughness of the surface.

"Well what of it," might be the comment of a busy administrator. "If we spend this money what improvement can we expect?" Improvements would be apparent in the quality of practically all finished work. The use of expensive hair and bristle brushes would be greatly reduced as would the difficulty of their care and storage. Paint brushes are seldom worn out but they are usually discarded because someone failed to clean them properly after use. An inventory of paint brushes might disclose some surprising facts. Brushes suitable for the application of stain, shellac, oil varnish, and other finishes used in school shops range in price from 70 cents for a one-inch brush, $1.10 for a 1½-in.

(Continued on next page)

SHELDON
CHICAGO U. S. A.

These 3 quality machine tools are especially adapted to school use because of their:

AMPLE SIZE – permits wide range of practical projects.

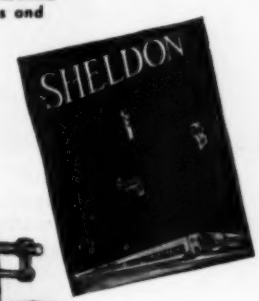
STANDARD DESIGN – true industrial tools with standard controls.

PERMANENT ACCURACY – these tools hold their accuracy under student abuse, do not require constant rebuilding and servicing.

SAFETY – all drives completely enclosed; all speed changes made by external levers.

PRICE – these are moderate priced tools that school shops can afford.

Write for the SHELDON Catalog showing and describing (with complete specifications) the line of: SHELDON Precision Lathes (9", 10", 11", and 13" Swing), Sheldon Milling Machines, Sheldon Shapers, and Sheldon Machine Tool accessories and attachments.



Horizontal Milling Machine — No. T556B 11¼" Swing Lathe — 12" Back Geared Shaper

SHELDON MACHINE CO. Inc.
Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
4244 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

SPRAY EQUIPMENT

(Continued from previous page)

brush, $1 to $2.80 for a 2-in. brush, $1.40 to $8 for a 2½-in. brush. It is evident that the annual expenditure for brushes could be a considerable amount. If good brushes kept in good condition are not provided the student cannot be expected to produce a good finish. More skill is required to become proficient with a bristle brush than with a spray gun and students are very interested in spray processes.

What Type of Finishing Material to Use

Many new materials and all of the older finishes are usable in a spray gun. It is probably correct to state that more shellac is used in school shops than any other film building material but the proper application of shellac with a brush is not an easy operation. An examination of a few shellacked projects would justify this statement. Shellac is easily sprayed in a uniform film. Oil varnish, with all of its attendant troubles, has been widely used in school shops. It is expensive and when the original container has once been opened the remainder has become contaminated and oxidation has begun. There is a great deal of oil varnish wasted because of the skim which forms over any amount which is left in a container for longer than a few hours. Why not make a decisive change and avoid the use of wasteful, slow-drying materials and use those which dry dust-free in a few minutes, can be recoated in less than one hour, and produce a finish equal in quality and appearance to that found on high grade furniture? Among these materials are:

1. Concentrated spirit type oil stains which produce beautiful colors, are non-grain raising, difficult to apply by brush, ideal for spraying.
2. Fast drying fillers which may be thinned sufficiently for spraying. Can be coated after drying four hours or less at room temperatures.
3. Sanding lacquers (sanding sealers). These sealers are formulated for spraying, can be sanded in less than one hour, sand exceptionally well, produce a silky smooth surface which is an excellent base for lacquers, plastic-type coatings, and other synthetics.
4. Lacquers, plastics, and synthetics, which are made in gloss, semigloss, and dull.

Lacquers cost less than shellac or oil varnish and there is no waste. A container of lacquer may be left attached to a spray gun indefinitely and no skim or coating will form in the jar. The material is ready for spraying at a moment's notice and will not even require stirring.

Finishing materials are undergoing constant changes with the main emphasis on building an attractive tough finish which dries quickly, can be applied by spray gun with the fewest possible operations. The industrial-arts program should keep abreast of these new techniques and materials.

modernize your machine shop now

install America's no. 1 machine tool drive...

the LIMA Gearshift Drive

Progressive schools everywhere are selecting LIMA DRIVES to modernize their present lineshaft driven machine tools — economically.

Photo above shows the installation of LIMA GEARSHIFT DRIVES at the Syracuse Vocational High School, Syracuse, New York.

LIMA DRIVES with all working parts enclosed, provide the utmost in functional safety, as well as adequate lighting, proper machine location and complete elimination of hazardous lineshafting.

Complete engineering facilities available

WRITE FOR LITERATURE

LIMA GEARSHIFT DRIVES & MOTORS

Representation in principal cities

THE LIMA ELECTRIC MOTOR COMPANY 3461 FINDLAY ROAD, LIMA, OHIO

AUTO-SHOP TEACHING AID

(Continued from page 126)

to this board and figure it out. The boys who did most of the wiring learned a great deal about it and became much interested in the job. A student can see the relationship of parts at a glance and does not need to go to some manual or other book to look it up. If the boy is doing trouble shooting in the electrical system, this board

(Continued on page 50A)

NOW! METALWORKING IS EASY AND FUN...

Aluminum screens that never rust or stain are fun to make with Reynolds *Do-It-Yourself* Aluminum . . . and so much easier than wooden ones!

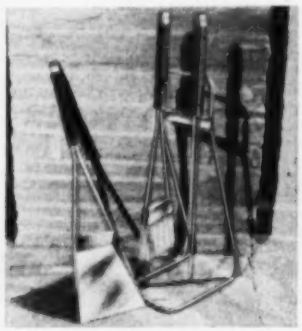
with amazing new REYNOLDS *DO-IT-YOURSELF** ALUMINUM

A real thrill for school craftsmen . . . no special skill required to make 1001 wonderful projects and repairs with *metal*.

You've waited years for this . . . a brand new kind of material that would make it possible for *all* your students *to make things with metal* . . . easily, quickly, inexpensively. Reynolds *Do-It-Yourself* Aluminum has all the beauty, rustproof qualities and permanence characteristic of high-quality Reynolds Aluminum. It is specially engineered for really astonishing workability. Your students can bend it, saw it, drill it, plane it, joint it, using standard woodworking hand or power tools. And it's so easy to use they can turn out projects that would do credit to a professional craftsman. Drop us a post card for full details of this fabulous new material today.

*T. M. Reynolds Metals Company

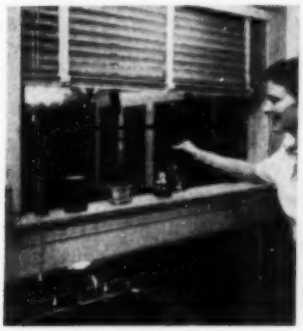
End table with a modern flair. Your students can make a whole nest in a hurry with this amazing new kind of aluminum.



Fire set that folks rave over is an easy fun-project for your students . . . and costs little . . . with Reynolds *Do-It-Yourself* Aluminum.

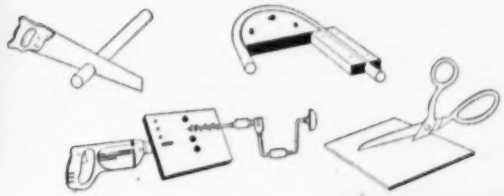
NO SPECIAL TOOLS are needed to work Reynolds *Do-It-Yourself* Aluminum . . . you can saw it, plane it, joint it, shape it, drill it with standard woodworking hand or power tools.

CAUTION: This new material is approved by leading tool makers. You are cautioned, however, to use only Reynolds *Do-It-Yourself* Aluminum because other types of aluminum may harm tools.



Window sill cover cut from Reynolds Aluminum Sheeting makes a fine metal-working project for your younger pupils.

Drip pan made of Reynolds *Do-It-Yourself* Aluminum is simple and fun to make . . . and a "must" for everybody's garage.



REYNOLDS *DO-IT-YOURSELF* ALUMINUM
consists of:
TUBING • RODS • BARS • ANGLES • PLAIN SHEETS
EMBOSSED SHEETS • SCREEN AND STORM SASH SECTIONS
FASTENERS • TRIM STRIP • WINDOW HARDWARE

WRITE FOR INFORMATION,
free "how-to" booklet and description of easy-to-follow plans:
REYNOLDS METALS COMPANY
2481 South Third Street, Louisville 1, Kentucky

AUTO-SHOP TEACHING AID

(Continued from page 48A)

helps him trace down his troubles and teaches him where to check for different defects. The parts of the electrical system can be learned very fast by looking at the board.

It was found that this project drew the interest of the students of the whole auto shop. We all know that when one can get the interest of the boy, the job is over half done, because an interested boy will be a good listener and will learn fast.

State-Wide Supervision of Industrial Arts

J. W. GIACHINO

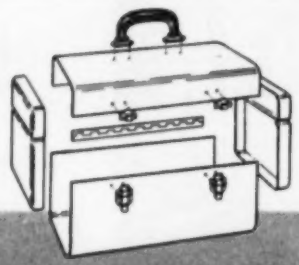
Professor of Industrial Education
Western Michigan College of Education
Kalamazoo, Mich.

One of the challenging and perplexing problems confronting industrial educators today is: "Should we have a state supervisor of industrial arts?" Whenever this question comes up for discussion, arguments for and against such a proposal are heard. Notwithstanding these controversial differences, there is usually general agreement that some form of state-wide supervision is necessary for teachers of industrial arts. The belief seems to be that supervision is essential for several reasons. First, there are still too many teachers leaving our teacher education institutions without a sound philosophy of industrial arts. Due to the nature of their teacher education preparation, many of these people have only a hazy idea of their full responsibilities as teachers. To some of them, industrial arts is a segment of education concerned primarily with manipulative work. Consequently, there exists in too many of our schools industrial-arts programs in which the emphasis is almost entirely on acquisition of skills. Furthermore, these industrial-arts shops, instead of providing a variety of educational experiences, usually confine their activities to a relatively few industrial areas which, for the most part, are still characteristic of the early manual training era.

Some type of state-wide supervision also seems appropriate because the majority of our young teachers go into school systems where no one on the administrative or supervisory staff knows anything about industrial-arts education. As a result, these new and inexperienced teachers are left to sink or swim alone and often to the detriment of the students. It is also inevitable that, due to the ever increasing complexity of our social organization, it is becoming extremely more difficult for teachers of industrial arts to carry out the functions of their phase of general education. Therefore, some kind of supervision seems justifiable if continued progress in industrial arts is to be expected.

(Continued on page 56A)

Now: A PREFORMED CONSTRUCTION KIT for ALUMINUM SHEET METAL SCHOOL PROJECTS

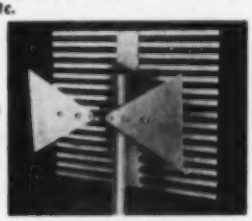


SCHWEIZER KIT #1A. Completely preformed as shown, also includes Blueprint, Construction Procedure, Rivet Set and rivets for easy assembly.

Finished Project: A durable lightweight Case, size 17"x8"x8", ideal for fishing gear, tools, camera equipment, etc.

Schweizer's Kit #1A has all sides and ends pre-formed ready for easy assembly into a handsome utility case. Specially designed as a project for metal shops without forming equipment, also for junior high; and for adult classes. Only common hand tools required. Excellent teaching medium with a most useful end product.
Special School Price, Kit #1A . . $4.25
Also the Schweizer Basic Utility Kit #1 with ends pre-formed only; Rivet Set included $3.95

TV Antenna Kit for UHF Areas



"Bow Tie" type antenna with unexcelled reception . . . students can build themselves. Schweizer Kits include everything needed.
Schweizer Antenna Kit #2 requires forming and drilling. $3.45 ea.
Schweizer Antenna Kit #2A, drilled, cut & pre-formed. $4.95 ea.

ATTENTION—Shop Instructors
Watch for new junior high projects now being prepared by Schweizer

SCHWEIZER AIRCRAFT CORPORATION
ELMIRA, N.Y.

SCHWEIZER AIRCRAFT CORP., Educational Division, Elmira, N.Y.
Send me the following kits:
Utility Case
..... Kit No. 1A— Quantity ..... Pre-formed @ $4.25
..... Kit No. 1— Quantity ..... Ends pre-formed only @ $3.95
Bow-Tie TV Antenna
..... TV Antenna Kit No. 2— Quantity ..... Requiring Drilling @ $3.45
..... TV Antenna Kit No. 2A— Quantity ..... Drilled, Cut and Formed @ $4.95
☐ FREE copy of Construction Kits for School Shop Students and Home Craftsmen.
All prices f.o.b. Elmira, N. Y.
Weight: Case Kit 4 1/2 lbs.; TV Kit 2 lbs.
☐ Check for amount enclosed
☐ Bill the School Purchase Order No. .....
Your Name ..... (Please print) (Title)
Name of School .....
Address ..... (City) (Zone) (State)

Snap-on MECHANICS STANDARD SERVICE SET

. . . puts the right tool right at their finger tips!

• Without a complete set of modern tools, shop training is as difficult as classroom instruction with inadequate and obsolete text books. Every tool in the Snap-on Standard Service Set is a basic in the kit of a competent, high-earning mechanic. Working with such tools, students rapidly learn the difference the *right* tool makes in speed, good work, pride of workmanship. There are 166 tools in this set, fully described in Snap-on's complete catalog of hand and bench tools. Free to school officials and instructors — write for your copy today.

*Snap-on is the trademark of Snap-on Tools Corporation.

No. 5166-GS-B

Snap-on Tools
THE CHOICE OF BETTER MECHANICS

SNAP-ON TOOLS CORPORATION
8074-C 28th Avenue • Kenosha, Wis.

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSOR
- a) 3 to 4 cu. ft., with tank, piping, and motor
- b) Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods
ANVIL
- a) No. 100 or No. 125
- b) Rim

ARMATURE GROWLER AND TESTER
AXLE STANDS
BATTERY EQUIPMENT
- a) Cell tester, panel type with discharge rack
- b) Charger (15-battery size) with rack
- c) Charger (6-battery size)
- d) Gas stove (small)
- e) Lead-burning torches, with gauges and piping
- f) Plate racks

BENCH
- a) Electric test, elaborate
- b) Electric test, simple
- c) Work, with vises
- d) Work, portable with vise

BLACKBOARD
BLOWTORCHES — 1-qt. size
BOOKCASE
BRAKE
- a) Adjusting stand
- b) Band-lining machine

BULLETIN BOARD
CABINETS
- a) Wood or metal, for bolts and supplies
- b) Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track
CHAIRS
- a) Teacher's
- b) For tables, or with tablet arms

CRANE — portable
CRANKSHAFT TRUING TOOL
CREEPERS
DESK — teacher's
DRILL
- a) Breast
- b) Hand
- c) Electric portable, ⅛ in.
- d) Electric portable, ¼ in.
- e) Press, 21 in., with motor and chuck

DYNAMOMETER — electric
FORGE — with blower and tools
FURNACES — gas
GREASE DISPENSERS
GRINDER
- a) Cylinder, with motor
- b) 8 in., with motor
- c) 12 in., with motor

HONES — cylinder
JACKS
- a) Lever, 1½-ton
- b) Floor, roller

LATHE
- a) 11 in. by 4 ft., with motor, chucks, and attachments
- b) 16 in. by 6 ft., with motor, chucks, and attachments

PRESS
- a) Arbor
- b) 30 ton

SPRAY PAINTING OUTFIT
VALVE REFACING MACHINE
VULCANIZER
- a) Electric steam for tube work
- b) Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch
WHEEL ALIGNMENT
- a) Gauge
- b) Test table

Automotive Shop — Small Tools

ABRASIVE — rubstone for cleaning castings in foundry
ALCOHOL TESTER
BATTERY
- a) Cell tester, prod type
- b) Cell tester, cadmium
- c) Clips, large
- d) Element pullers
- e) Fillers
- f) Funnels, glass
- g) Hydrometer, acid
- h) Knives
- i) Post builders
- k) Post drills
- l) Post markers
- m) Separator trimmer

BITS
- a) Expansive
- b) Ratchet brace
- c) Wood, 5/16 in. to 1 in.

BOLT CUTTER — 24 in. and 36 in.
CALIPERS — 6 in. inside and outside
CANS
- a) Oil, ½ pt.
- b) 1 gal., gas, safety
- c) 5 gal., gas, safety
- d) 5 gal., kerosene
- e) Waste

CHECKS — tool, 1000, blank
CHISELS
- a) Cape, 3/8 in. and 5/8 in.
- b) Cold, 3/8 in., 5/8 in., 3/4 in., 1 in.
- c) Diamond point

COMBINATION SQUARES — 12 in.
COTTER-PIN EXTRACTOR
DIVIDERS — 6 in. and 10 in.
DRILL SETS
- a) 1/32 in. to ½ in., by 64ths
- b) ½ in. to 1¼ in., by 32nds

FILE CARDS
FILE HANDLES — assorted
FILES
- a) Flat bastard, 6 in., 8 in., 10 in., and 12 in.
- b) Half round, 6 in., 8 in., 10 in., and 12 in.
- c) Mill, 6 in., 8 in., 10 in., and 12 in.
- d) Round, 6 in., 8 in., 10 in., and 12 in.
- e) Square, 8 in., 10 in., and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid
FIRST-AID CABINET AND SUPPLIES
FLOOR BRUSHES — 18 in.
FUNNELS — tin, assorted sizes
GAUGES
- a) Air pressure
- b) Center
- c) Depth
- d) Thread
- e) Thickness

GLASS CUTTERS
GOGGLES
GREASE GUNS — plain and pressure type
HAMMERS
- a) Ball peen, 4 oz.
- b) Ball peen, 1¼ lb.
- c) Ball peen, 2 lb.
- d) Lead
- e) Riveting
- f) Sledge, No. 12

LADLE
- a) 3-in. bowl
- b) 6-in. bowl

LAMPS — extension, with reels
LEAD POT — gas
MAGNET CHARGER
METERS — volt and ammeter test
MICROMETERS
- a) Outside, 0 to 1 in.
- b) Outside, 2 in. to 3 in.
- c) Outside, 3 in. to 4 in.
- d) Inside, 1½ in. to 6 in.

MOLDS
- a) Battery nut
- b) Battery post
- c) Battery strap
- d) Burning stick
- e) Lead hammer

OILSTONE
PIPE TAPS — 1/8 in., ¼ in., 3/8 in., and ½ in.
PLIERS
- a) Combination, 6 in.
- b) Flat nose
- c) Roundnose

PULLERS
- a) Bearing
- b) Gear
- c) Wheel, hub type

PUNCHES
- a) Center
- b) Taper pin
- c) Blacksmith

PUTTY KNIVES
REAMER — spindle bolt
REAMER SETS
- a) Piston pin, ½ in. to 1 3/16 in.
- b) Taper pin
- c) Valve seat

SAWS
- a) Hack, frames, 10 in., adjustable
- b) Hack-saw blades, 18, 20, and 24 teeth
- c) Hand

SCALES
- a) Steel, 6 in., graduated 1/64 and 1/100 in.
- b) Steel, 12 in., graduated 1/32 in.

SCRAPERS
- a) Bearing
- b) Carbon

SCREW DRIVERS
- a) 6 in. and 12 in.
- b) Small combination

SCREW EXTRACTORS
SCRIBERS
SNIPS — tin, 3 in. straight and 3 in. curved
SOLDERING COPPERS
- a) Assorted
- b) Electric
- c) Handles

SPRING SPREADERS
STAMPS
- a) Figures, 3/16 in.
- b) Letters, 3/16 in.

TAP-AND-DIE SETS
- a) Machine screw
- b) N.F. ¼ in. to 1 in.
- c) N.C. ¼ in. to 1 in.

TIRE TOOLS
TOOL KIT — metal box or canvas roll, empty
TWIST DRILLS — (extra sets) selected sizes
VALVE
- a) Grinders (hand)
- b) Spring lifters

WRENCHES
- a) 8 in., 10 in., 12 in., and 18 in.
- b) Ignition sets
- c) Pipe, 10 in., 14 in., 16 in., and 18 in.
- d) Rim socket
- e) Socket sets, large assortment with case
- f) Spark plug
- g) Speed wrenches
- h) Standard end sets, ¼ in. to 7/8 in., N.C. and N.F.
- j) Valve-tappet wrenches

(Continued on page 55A)

TRAIN THEM WITH EQUIPMENT
PREFERRED BY THE INDUSTRY

CURTIS PRECISION-BUILT
AIR COMPRESSORS · AUTO LIFTS
CAR WASHERS

100 Years of Manufacturing "Know-How"

AIR COMPRESSORS
¼ THROUGH 10 H.P.

Dependable, trouble-free performance —

Timken roller main bearings

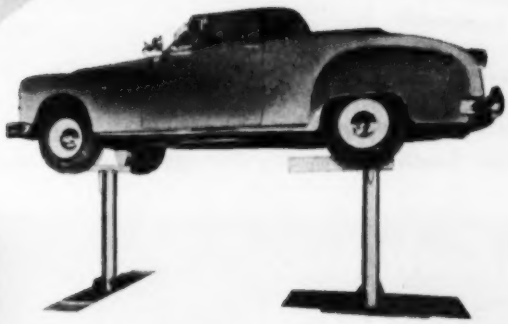
Positive unloaded starting

"Centro-Ring" lubrication

ASME tank — Deep penetrating welds

HYDRAULIC CAR WASHERS
(300 Pounds Pressure)

More cars can be washed cleaner in less time with this silent, self-oiling power washer.



FULL HYDRAULIC TWO-POST SHOP LIFT

Complete accessibility for better, faster work — Ample lifting height — Provides safe pick-up — 60" wheelbase range — Minimum installation cost.

SINGLE POST LIFTS —

Full and semi-hydraulic

Free-wheel platform

Roll-on platform

A-51-3

Other Curtis Products

LARGE VOLUME AIR COMPRESSORS, up to 50 H.P. — water cooled.

AIR HOISTS AND AIR POWER CYLINDERS — for low cost material handling, pushing and pulling operations.

For complete information on any of these products, mail a post card to Curtis listing the products in which you are interested.

CURTIS
PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1909 Kienlen Ave. · St. Louis 20, Mo.

maximum project storage

No. 64-50-400-C

Cabinet Base Woodworking Bench

Bulky project storage need no longer be a headache! Let this new Four-Student Woodworking Bench solve your problems. Storage base consists of two roomy all-steel cabinets (back-to-back), each with an adjustable shelf and double swinging doors.

Bench is a big 64" by 50", and smooth 2¼" laminated maple top is equipped with four continuous screw woodworkers' vises.

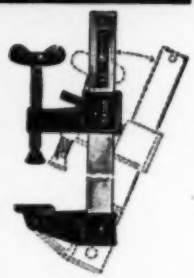
Send for Industrial Arts Equipment Catalog

Write — right now — for all the facts!

PARENT METAL PRODUCTS, INC.
234 South Fourth St., Philadelphia 6, Penna.

Bar Clamps with *hinged foot* . . . swing to and from work.

Mount on any flat surface . . . bench, saw horse, etc., to make instant acting clamping jigs or fixtures. Ideal for repeat operations. Clamps are fixed, always available when needed—but swing out of way when not in use. Also usable as regular bar clamp.



WRITE for "Jorgensen" Hinged Clamp details and catalog.

ADJUSTABLE CLAMP CO.

424 No. Ashland Ave. • Chicago 22, Illinois

Economical
ARBOR PRESSES
FOR SCHOOL SHOPS

An ideal press for school shops requiring pressures up to 3 tons. Just the right size to handle practically all work usually found in these shops. Also widely used in all kinds of industry.

HAND WHEEL — Advances the ram to the work quickly and easily.

ADJUSTABLE HANDLE — Position is adjustable with a ratchet.

COUNTERWEIGHT — Keeps handle in uppermost normal position.

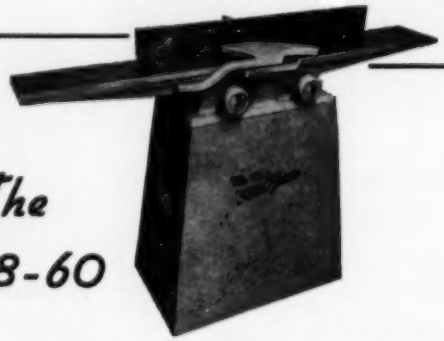
AUTOMATIC BRAKE — Automatic pressure brake holds ram in any position.

MACHINED TABLE — Large surface provides accurate work support.

SQUARE RAM — Heat-treated ram with large bearing surfaces and shimmed cap to provide long wear.

For more detailed information on this and other size presses, write for the illustrated Dake Arbor Press Catalog.

DAKE ENGINE COMPANY
653 SEVENTH STREET
GRAND HAVEN, MICH.



The 58-60

MODERN NEW JOINTER!

60 inch table . . . 37 inch fence

● Here's the new 6-inch jointer with smooth tapered stand designed by Heston & Anderson. Try its big table. See how its 37 inch fence steps up production. Built for heavy duty, the 58-60 will more than do its job in any plant or work shop.

Send today for the name of your nearest dealer!

HESTON & ANDERSON
Division of St. Paul Foundry & Mfg. Co.
15-11G FAIRFIELD, IOWA

Automotive Shop — Materials and Supplies

(Continued from page 52A)

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide

ACETYLENE GAS — in drums, for welding

ACID

ALCOHOL

BABBITT

BEARING BLUE

BEARING COMPOUND
- *a*) 600W
- *b*) Penetrating

BOLTS
- *a*) Machine, selected sizes
- *b*) N.F. selected sizes
- *c*) Stove, flat or round heads, selected sizes

BRAKE JUICE — ½-pt. cans

BRUSHES
- *a*) Paint
- *b*) Spark plug
- *c*) Spoke
- *d*) Steel
- *e*) Varnish

CHAMOIS

COIL-SPRING ASSORTMENT

COPPER TUBING

COTTER PINS — assorted sizes

CROCUS CLOTH

DISTILLED WATER

DRAIN COCKS

ELECTROLYTE

ENAMEL — AUTO PAINTING

GASKETS
- *a*) Copper asbestos
- *b*) Cork and felt
- *c*) Flange

GASOLINE

GREASE — cup, cans

KEROSENE

KEYS, WHITNEY — assorted

LACQUER — colors

LEAD

LUBRICANT — transmission

NAILS AND BRADS

NUTS
- *a*) N.F., castellated. square, hexagon, selected sizes and kinds
- *b*) N.C., square and hexagon, selected sizes
- *c*) Machine screw, selected sizes
- *d*) Wing, selected sizes

OIL
- *a*) Cylinder, light, medium, and heavy

OXYGEN — in drums for lead burning

PIG LEAD

PISTON-RING COMPRESSORS

RADIATOR HOSE

RIVETS — brake lining, 5/16 in., ½ in., and ¾ in. long

SCREWS
- *a*) Flathead or roundhead, iron or brass, selected sizes and kinds
- *b*) Cap and machine, iron or brass, selected sizes and kinds

SEALING COMPOUND

SHELLAC — ½-pt. cans

SHIM STOCK

SOAPSTONE

SOLDER — bar, wire, or self-fluxing wire

SOLDERING PASTE

SPELTER — for brazing

SPONGES — ½ lb.

STARTING CABLE

TACKS AND STAPLES — upholstery

TIRE
- *a*) Carcass fabric
- *b*) Cushion stock
- *c*) Inner-tube repair stock
- *d*) Patching cement
- *e*) Patches
- *f*) Putty
- *g*) Tread stock
- *h*) Vulcanizing

VALVE-GRINDING COMPOUND — coarse and fine

WASHERS
- *a*) Lock, assorted sizes
- *b*) Wrought iron

WASTE

WIRE — primary and secondary

New Texts for Your Classes

General Shop

Groneman and Feirer. A new text of the *McGraw-Hill Publications in Industrial Arts.* Presents 128 units in drawing and planning, woodworking, electricity, plastics, leather, and home mechanics. Basic information on tools and materials. 27 projects.

Drawing, Sketching and Blueprint Reading

Coover. Teaches the student to read industrial drawings and then how to make accurate, legible drawings and sketches with facility and ease. Functional, dynamic, and adaptable.

Machine Tool Operation, Parts I and II, New Edition
Burghardt & Axelrod

Carpentry for the Building Trades, New 2nd Edition

Carpentary Workbook
Lair

General Metals
Feirer

General Woodworking
Groneman

McGraw-Hill Book Company, Inc.
330 West 42nd Street New York 36, N. Y.

The stack molding technique, illustrated here, was made possible by using Sterling flask sections to step up casting production. Ten flask sections are being poured at a time. A common sprue through the stack feeds the molten metal to runners leading to individual castings cavities.

Sterling Steel Flasks are ideal for stack molding because they are built to withstand terrific pressures. A reinforcing rib around the side prevents distortion and misalignment of the stacked molds. Top and bottom have solid sand flanges. Full width bearing.

Write for new catalog describing the complete Sterling line.

STERLING WHEELBARROW CO. Milwaukee 14, Wis., U. S. A.

They're **TOPS**

TOLCO
THE TOLERTON COMPANY
Alliance, Ohio

Research Proves **TOLCO** SUPERIOR!

They're tops on the market today, because of a constant research and development program. Research proves that the Tolco method of construction gives you a laminated top with a 100% glue bond between every lamination. This is impossible with wider laminations. Make Tolco the first choice for your shop.

Illustrating Tolco Model TM-12. A four student bench with extra heavy metal base and famous Tolco Top. Write for 1954 Catalogue in color.

THE TOLERTON CO.
N. Freedom Ave. Alliance, Ohio
Established 1894

STATE-WIDE SUPERVISION

(Continued from page 50A)

The State Supervisor of Industrial Arts

If we stop to analyze the various aspects of state-wide supervision of industrial arts, there appear four possible solutions to this problem. One answer, of course, is to appoint a qualified state supervisor. Unquestionably, such an individual would render some useful services. Whether he can provide a type of supervision that is actually needed in the field is dubious. Ostensibly, a state supervisor must of necessity spend a considerable portion of his time with routine paper work. If he can reduce this detail to a minimum, which is doubtful, the number of visitations he could make to schools would be comparatively few. At least it would be practically impossible for him to devote any appreciable length of time observing, advising, and assisting very many industrial-arts teachers. In all probability his time would be in such constant demand that his appearance would be limited to making speeches, or going on brief inspection tours in schools located in the larger towns and cities.

To implement an effective supervisory program, a state supervisor of industrial arts would need a fairly large staff. The difficulty with such an arrangement would be the cost of the program. Since state legislatures and/or state departments of public instruction are somewhat reluctant to provide funds for even *one* state supervisor, it is certain that they would not accept the idea of maintaining a staff of supervisors. Seemingly then, with a single state supervisor his contributions, in addition to those mentioned previously, would be restricted to formulating policies, preparing informational material, and acting as a clearing house for major industrial-arts problems.

The State Advisory Industrial-Arts Committee

A second solution to a state-wide supervisory program may be in the form of a state advisory industrial-arts committee. This committee presumably could be under the leadership of someone in the state department of public instruction and consist of a number of outstanding industrial-arts teachers, supervisors, and teacher trainers. Such a committee has certain attributes and limitations. From the standpoint of cost, very little expense would be involved except for travel purposes for members of the committee. In some respects this committee could function much like the single state industrial-arts supervisor. It is possible, of course, that occasionally some members of the committee may be influenced to visit schools where assistance is requested. But since these individuals are full-time employees of some local board of education or members of a college staff, it can readily be seen that the time spent away from their regular duties would have to be limited. As a result, the services of a state advisory committee would have to be confined to formulating policies, preparing instructional bulletins, and periodically meeting to discuss problems of a general nature. It would be impossible for a committee of this kind to develop, maintain, and render continuous supervisory services throughout the entire state.

A Committee of Consultants for Industrial Arts

A third type of state-wide supervisory program might consist of a number of resource people located in various parts of the state who could be called upon to provide supervisory services. For example, the state department of public instruction might arbitrarily select a few outstanding industrial-arts teachers, supervisors, or teacher trainers and designate them as educational co-ordinators, supervisors, or consultants. These people would be located in strategic areas of the state and they would restrict their services to schools within their designated regions. The department of public instruction would simply serve as a central agency to receive requests for supervisory services. Upon receipt of these requests, it would transmit them to the appointed supervisors. They, in turn, would proceed to the schools and perform whatever duties that were required.

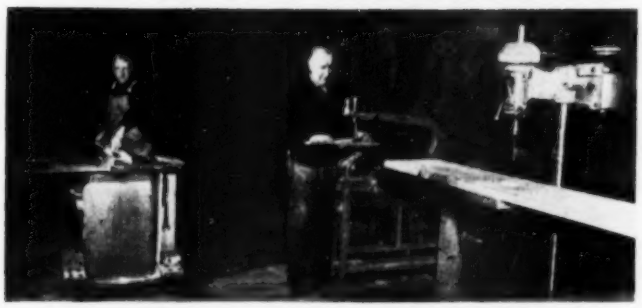
On the surface, this plan looks promising. However, it has two serious drawbacks, one of which becomes apparent immediately. Since the appointed resource people are not on the state payroll, it is problematical as to the amount of time they could spend away from their regular jobs. Local boards of education or college officials may graciously excuse these people to make occasional visits. But if the demand on these individuals would necessitate frequent absence from their duties, objections would soon be raised. It is possible, too, for a state department of public

(Continued on page 58A)

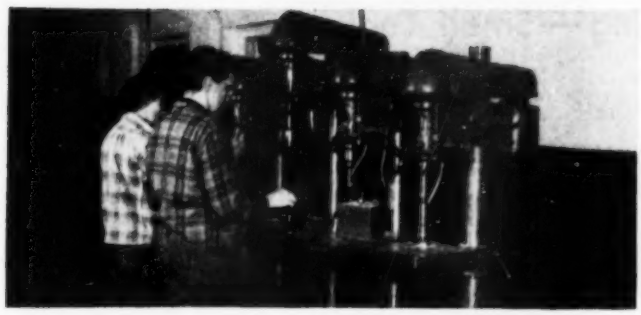
Teach With Tools They'll Use In Industry

. . . Rockwell-built DELTA Power Tools

Copeland Refrigeration Corp., Sidney, Ohio, uses 22 DELTA Drill Presses in the manufacture of refrigerator components. Copeland employs many of the graduates of local and surrounding schools. Those who have received school shop training on DELTA tools are able to assimilate their work and advance themselves far more rapidly.



Franklin Square Lumber Company, Franklin Square, N. Y. does a volume carpentry and millwork business with their DELTA Scroll Saws, Band Saws, Drill Presses, Lathes, and Jointers. In mills such as this, there are constant opportunities for the students you have trained with power tools. And a tremendous number of millwork shops are equipped with DELTA Power Tools.



Cupples Products Corporation, St. Louis, Missouri, nationally known aluminum window manufacturer, uses DELTA Drill Presses at key points throughout the entire production line. It is understandable that those Cupples' workers who were trained in DELTA equipped school shops become profitable and satisfied employees faster, and with less on-the-job training.

In your community, many industries use Rockwell-built DELTA Power Tools in their regular production operations. They have found that low-cost, precision DELTA tools will handle 90% of the jobs formerly done with costly, immovable machines. The students who have acquired a knowledge of working processes and consequent skills with DELTA Power Tools become readily employable by these companies.

DELTA Tools are accurate production machines, yet they are amazingly easy to operate, and incorporate every conceivable safety device. Completely versatile, they enable you to include virtually every production application in your course of instruction.

* * *

Discover for yourself why DELTA Power Tools are the most practical for School Shop training. See your DELTA Dealer today! Send the coupon for full information. Increased production facilities allow immediate delivery on school orders. No waiting.

DELTA QUALITY POWER TOOLS
Another Product by **Rockwell**

DELTA DELTA QUALITY MAKES THE DIFFERENCE

Delta Power Tool Division,
Rockwell Manufacturing Co.
402C North Lexington Ave., Pittsburgh 8, Pa.

☐ Please send DELTA AB-53 catalog.
☐ Please send name of my nearest DELTA Dealer.

Name _____
Address _____
City _____ Zone ____ State _____

Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH
- *a*) Shop, with hardwood tops, 1¼ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
  It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
- *b*) Glue
- *c*) Stain, with metal-covered top
- *d*) Teacher's demonstration

BLACKBOARD — permanent or portable

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
- *a*) Automatic knife, direct-motor-type. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
- *b*) Bench, hand or power
- *c*) Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
- *d*) Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
- *a*) 6-in. or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard.
- *b*) 12, 16, or 18 in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

LATHES
- *a*) 6-in. to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
- *b*) Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
- *a*) Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
- *b*) Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12, 18, 20, 24, or 30-in., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

SANDER
- *a*) Belt, direct motor drive
- *b*) Disk, motor or belt driven
- *c*) Oscillating spindle, motor driven
- *d*) Portable, hand-plane type, direct motor drive
- *e*) Vertical spindle and disk sander

SAWS
- *a*) Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
- *b*) Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded.
- *c*) Cutoff, pedestal or swing type to be fitted with 12-in. to 16-in. saw
- *d*) Filing machine, direct motor drive
- *e*) Jig, direct motor or belt driven
- *f*) Portable band saw, 14 to 20 in. ball bearing, motor driven
- *g*) Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
- *h*) Universal saw bench, 14 to 16 in., motor driven
- *j*) Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
- *a*) Motor drive, single or double spindle. Table to be equipped with removable center plate.
- *b*) Portable shaper or router with a suitable selection of cutters

TENONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class.

Woodworking — Small Tools

AWLS — brad, assorted sizes

BEVELS
- *a*) Protractor
- *b*) Sliding T, 8 in.

BITS
- *a*) Auger, 3/16 in. to 1 in., inclusive, by 16ths
- *b*) Auger, 3/16 in. to ½ in. inclusive, by 16ths
- *c*) Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
- *d*) Countersink, for wood, rose pattern, ½ in. and ⅝ in.
- *e*) Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
- *f*) Expansive, ⅞ in. to 1½ in.
- *g*) Expansive, ⅞ in. to 3 in.
- *h*) Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
- *j*) Screw driver square shank, ¼ in., 5/16 in., ⅜ in.
- *k*) Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
- *l*) Twist drill, straight shank, 1/16 in. to ⅜ in., inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
- *a*) Bench duster, 10 in.
- *b*) Floor
- *c*) Glue, round, 1½ in. and ¾ in.
- *d*) Glue, round, 1½ in.
- *e*) Marking, camel's hair, No. 1 and No. 2
- *f*) Varnish, flowing, 2 in. and 2½ in.
- *g*) Varnish, flat, ½ in., ¾ in., and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
- *a*) Sets containing 6 tools
- *b*) Sets containing 12 tools

CHISELS
- *a*) Cold, machinists', ⅜ in. and ½ in.
- *b*) Mortising chisel and bits, ¼ in. to ⅝ in. by 16ths
- *c*) Socket firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1½ in.
- *d*) Socket firmer, plain edge, ½ in., ¾ in., and 1 in.
- *e*) Tanged firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
- *a*) Bar, 24, 36, 48, and 60 in.
- *b*) Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

(Continued on page 62A)

STATE-WIDE SUPERVISION

(Continued from page 56A)

instruction to make some financial arrangement with local boards of education to reimburse them for the time the designated resource people are away from their regular duties. Despite a satisfactory financial settlement, innumerable other problems would occur. If the resource person is a teacher, the school would have to arrange for a substitute or dismiss the shop classes during his absence. In a large city, a qualified substitute may be available but seldom would one be found in a small community. If the resource individual is a local supervisor, it is conceivable that he might more conveniently arrange for his absence. Nevertheless, the fact remains that if the job of the local supervisor is warranted, then he cannot assume too many other obligations without incurring a great deal of criticism.

The most objectionable factor of this plan is the false premise upon which supervisory services would function. Under this plan, supervisory services would be offered only when requested. A close scrutiny of these demands would disclose several things. First, there will be some legitimate requests from teachers who really need assistance. But in all probability, requests from such people would be few. More demands would be forthcoming from teachers who are merely looking for a little publicity or a

(Continued on page 63A)

Start tomorrow's

"DO-IT-YOURSELF"

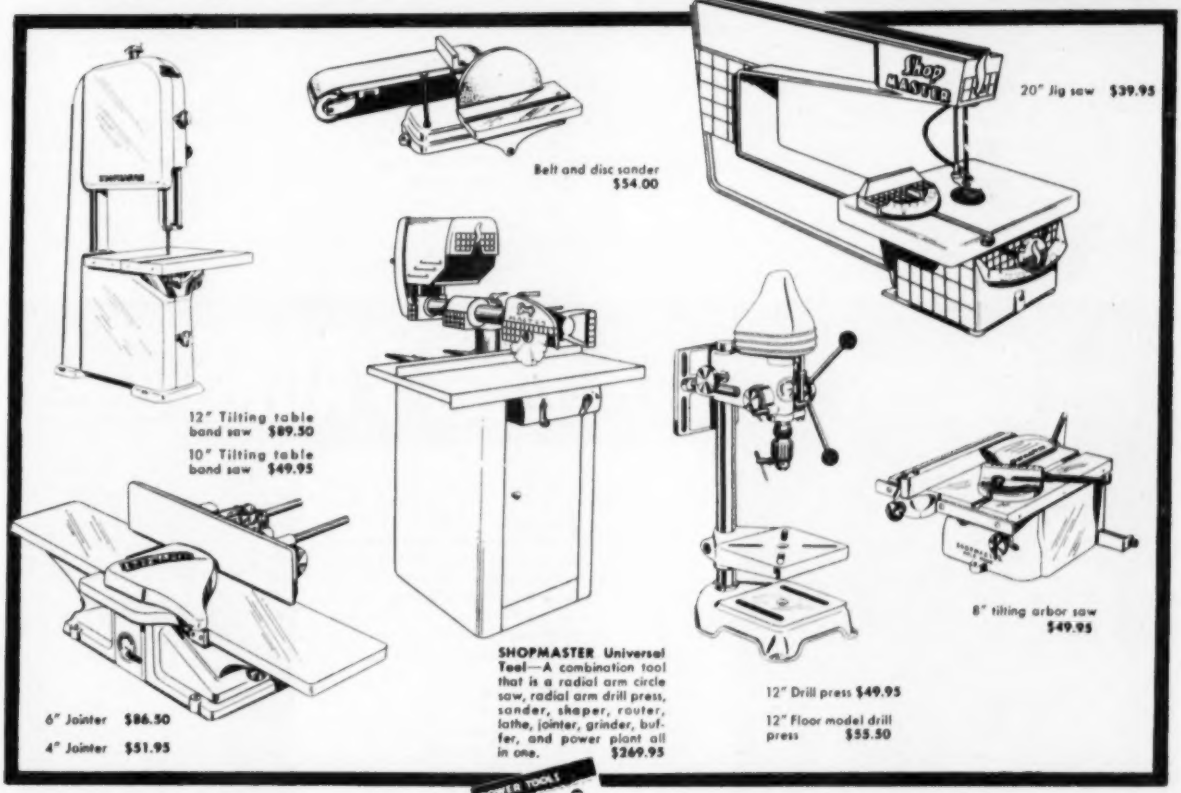
craftsmen with tools they'll use in their homes

It's common sense to train students with SHOPMASTER Tools. They're designed for easy operation, yet efficient enough to meet high professional standards.

SHOPMASTER Tools have the quality and ruggedness for school workshops . . . and at low prices.

Using SHOPMASTER Tools in schools will give students practical ideas. They'll have the know-how to operate industrial equipment . . . they'll also know how to use power tools that fit into any home.

Teach them on a SHOPMASTER Tool. It's the tool they'll use tomorrow at home.


Shop Master
20" Jig saw $39.95
Belt and disc sander $54.00
12" Tilting table band saw $89.50
10" Tilting table band saw $49.95
6" Jointer $86.50
4" Jointer $51.95
SHOPMASTER Universal Tool—A combination tool that is a radial arm circle saw, radial arm drill press, sander, shaper, router, lathe, jointer, grinder, buffer, and power plant all in one. $269.95
12" Drill press $49.95
12" Floor model drill press $55.50
8" tilting arbor saw $49.95

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Please send me the new Shopmaster catalog.

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City_____ Zone____ State_____

Position_____

Do you want additional catalogs for class use? Yes___ No___

(Continued from page 58A)

DIVIDERS — wing, 6 in. and 10 in.
DOWEL PLATE — 6 in. long.
DOWELING JIGS — with bushings
DRAWKNIVES — 7 in.
DRILL
- *a)* Automatic hand, with 8 drill points
- *b)* Chuck, 0 to ⅜ in.
- *c)* Hand, 0 to ⅜ in., for round-shank drills
- *d)* Star, for concrete, ½ in. and ¾ in.

FILES
- *a)* Auger bit, assorted, 6 in.
- *b)* Cabinet, 8 in. and 10 in.
- *c)* Card and brush
- *d)* Flat, wood, 10 in.
- *e)* Mill, bastard cut, 12 in.
- *f)* Round, bastard cut, 12 in.
- *g)* Taper, slim, 5½ in. and 7 in.

FIRST-AID CABINET AND SUPPLIES
GAUGES
- *a)* Bit, adjustable
- *b)* Jointer
- *c)* Marking, metal or hardwood
- *d)* Mortise, metal or hardwood
- *e)* Panel

GLASS CUTTER
GOUGES
- *a)* Tanged firmer, outside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
- *b)* Tanged firmer, inside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
- *c)* Spoon, ½, ¾, and 1 in.

HAMMERS — claw, bell faced, 10, 12, 13, and 16-oz.
HATCHET — bench, 4-in. cut.
JARS — earthenware, 1-qt. capacity
KNIVES
- *a)* Jointer, to fit power machine
- *b)* Planer, to fit power machine
- *c)* Sloyd, 3-in. blade

LEVELS
- *a)* Wood, 24 in.
- *b)* Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head
NAIL SETS — 1/16 in. and 3/32 in. points
OILERS — bench, ½ pt., coppered, best grade
OILSTONES
- *a)* 1 by 2 by 8 in. in iron box
- *b)* Gouge slip, medium, 4½ by 2⅛ by 5/16 by 5/16 in.
- *c)* Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

PINCERS — 6 in. carpenters'
PINCH DOGS — ¾, 1, and 1¼ in.
PLANES
- *a)* Block, adjustable, 6 in. long, 1⅝-in. cutter
- *b)* Circular
- *c)* Combination, adjustable
- *d)* Core box
- *e)* Duplex, fillister and rabbet
- *f)* Fore, ⅛ in., 2⅜-in. cutter
- *g)* Irons, double
- *h)* Jack, 14 in., 2-in. cutter
- *i)* Jointer, 24 in.
- *k)* Round, wood, 1¾ in.
- *l)* Router
- *m)* Smooth, 9 in., 1¾-in. or 2-in. cutter

PLIERS
- *a)* Roundnose, 5 in.
- *b)* Side-cutting, 6 in.

PUTTY KNIVES
RASPS — half round, wood, 10 in.
RULES
- *a)* Board
- *b)* 1 ft. or 2 ft. graduated by 8ths and 16ths
- *c)* Shrink, ⅛ in., 3/16 in.

SAWS
- *a)* Back, 12 in., 14 point
- *b)* Band, to fit power machine
- *c)* Compass, 10 in.
- *d)* Coping, frames
- *e)* Coping, blades
- *f)* Crosscut, 9 tooth, 22 in. long
- *g)* Crosscut, circular for power machine
- *h)* Dado, ⅛ in. to 1 1/16 in. to fit power-saw arbor
- *i)* Hack, frames, 10 in. or adjustable
- *k)* Hack, blades, 10 in.
- *l)* Keyhole, 10 in., 10 point
- *m)* Rip, 7 point, 22 in. long
- *n)* Rip, circular for power machine
- *o)* Set, 10 points per inch and finer
- *p)* Set, 10 points per inch and coarser
- *q)* Turning frame, 14 in.
- *r)* Turning blades, 5/16 by 12 in., 10 tooth
- *s)* Miter box, 24 by 4 in. saw, 7 in. capacity at miter

SCRAPERS
- *a)* Cabinet
- *b)* Glue, triangular
- *c)* Veneer, blade, 2¾ in. long, handle 11 in. long

SCREW DRIVERS
- *a)* Cabinetmakers', 4, 6, and 8 in.
- *b)* Quick return, spiral ratchet

SHOOT BOARD — and plane
SNIPS — tinners', forged steel, 2½-in. cut
SPOKESHAVES — adjustable, raised handle, 10 in. long
SQUARES
- *a)* Combination, 12 in.
- *b)* Try, iron handle, 8 in.
- *c)* Framing, 2 ft.

STEEL FIGURES — hand cut, ⅛ in.
TAPELINE — 50 ft., steel
TRAMMEL POINTS — adjustable metal frame, steel points
TURNING TOOLS
- *a)* Calipers, 6 in. inside and outside
- *b)* Calipers, 12 in. inside and outside
- *c)* Parting tools, ⅛ in.
- *d)* Round point, ¼ in., ½ in., ¾ in.
- *e)* Spear point, ¼ in., ½ in., ¾ in.
- *f)* Square point, ¼ in., ½ in., ¾ in.
- *g)* Turning chisels, ¼ in., ½ in., ¾ in.
- *h)* Turning gouges, ¼ in., ½ in., ¾ in.
- *i)* Turning skews, L.H., ¼ in., ½ in., ¾ in.
- *k)* Turning skews, R.H., ¼ in., ½ in.

VISE — 3-in. jaw, anvil face
WRENCHES
- *a)* Adjustable, 8, 10, and 12 in.
- *b)* Headless setscrew
- *c)* Pipe, 10 in. and 12 in.
- *d)* S type or open-end type to fit ⅛-in. to 1-in. N.C. nuts

(Continued on page 64A)

Your Students Will Learn FASTER on a PARKS PLANER

Students advance quickly on Parks Planers because they find them easy to operate, safe, and accurate. And, since both the Parks 12" and Parks 20" Planers have been designed and precision-built for accuracy and high-speed line production in industry, they are ideally suited for the school shop because they give practical experience on the type of machines your students will eventually use. Both machines are priced low enough for even the most modest shop budget.

The Parks No. 20. 20" Planer has a 4-knife cutterhead with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M., and 40 and 80 F. P. M. Will take work up to 20" wide by 6" thick. Ruggedly built for vibrationless operation.

The Parks Heavy-Duty 12" x 4" Planer. A compact, sturdy thickness planer that offers mill planer precision at low price. Has feed speed of 16 F. P. M. at 4000 R. P. M. Will handle material as short as 6" and as thin as 1/16".

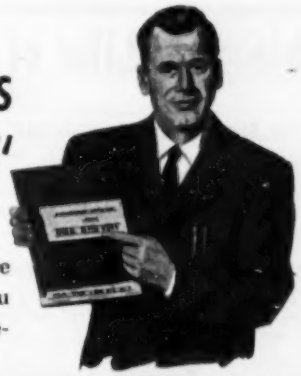
Write for complete descriptive literature.

Manufacturers of Quality Woodworking Machines since 1887.

The PARKS WOODWORKING MACHINE CO., Dept. 24-B15, 1546 Knowlton St., Cincinnati 23, Ohio

Send For "Electrical Requirements for High School Electric Shops"

(INDUSTRIAL ARTS LEVEL)



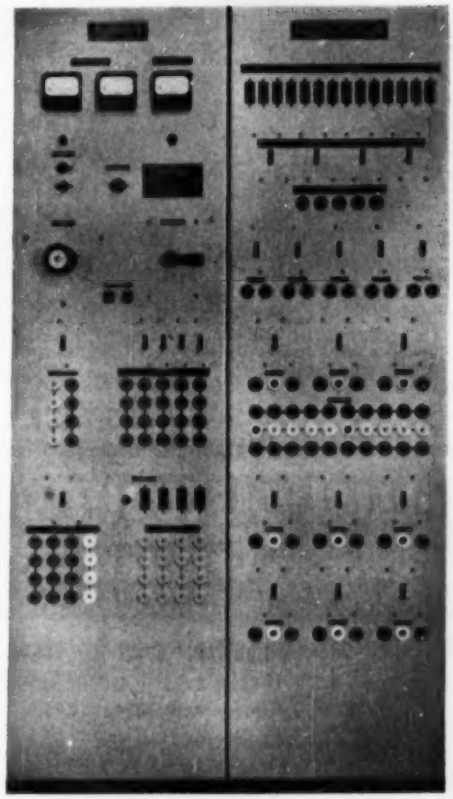
You should have our Booklet No. 205, with the above title . . . *especially* if you are planning a new shop or re-vamping your present one. This booklet will give you valuable suggestions. It offers a shop layout plan and lists fundamental requirements. Fill in the coupon below for prompt attention by us.

Safe, Timesaving, Up-to-the Minute Equipment

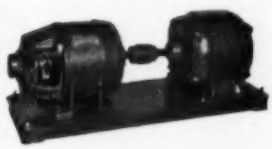
SERVICE UNIT
A typical bench unit for a 2- or 3-wire variable service, 120V a-c and a continuity test circuit. Single or double faced. Many other types available.

DISTRIBUTION SWITCHBOARD

This controls and distributes all the various a-c and d-c currents required for any work in the Electric Shop.



CONNECTOR CORDS
Other types furnished to meet requirements.



MOTOR GENERATOR
A typical machine for furnishing 125V d-c. Can be furnished in any size required.

THE STANDARD ELECTRIC TIME COMPANY

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CHECK
Contemplating new Electric Shop ☐
Contemplating re-vamping present shop ☐

Name _____

Title _____

School _____

City _____ *State* _____

Double the Life of Your Saws — Train Your Students Better

with

FOLEY SAW FILING EQUIPMENT

EXCELLENT STUDENT TRAINING

Train your students to use Foley machines. They will do better work with Foley sharpened saws. Foley equipment is safe to operate and is widely used by hundreds of schools, colleges, industries, Army, Navy, Air Force, etc.

FASTER SAW RECONDITIONING

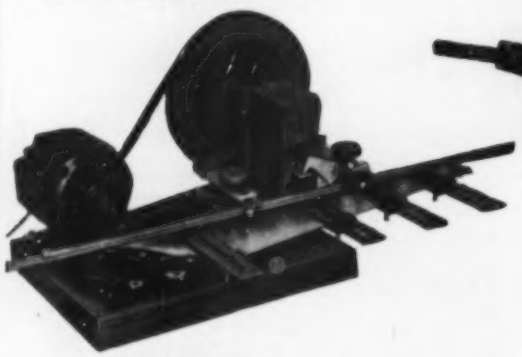
You can sharpen 4 to 6 hand saws per hour with these three Foley Automatic power machines — Retoother, Saw Filer, Setter.

VOCATIONAL REHABILITATION

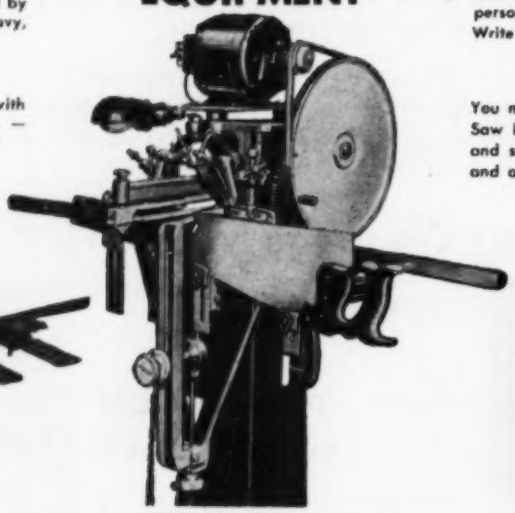
Foley Saw Sharpening Machines have proven their value for making physically handicapped persons self-supporting in their own business. Write us for full details.

30-DAY TRIAL OFFER

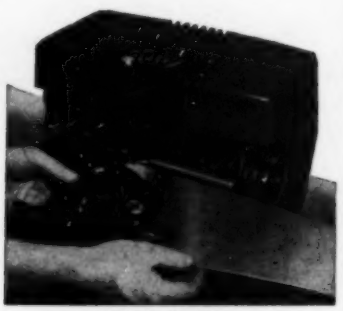
You may have the privilege of using a Foley Saw Filer in your own shop for 30 days, — and see for yourself its training advantages and operating economies. Ask us about it.



FOLEY RETOOTHER
Cuts new teeth in old saws (either straight or crowned edge) in one run through machine.



FOLEY SAW FILER
Files hand, band and cross-cut circular saws with machine accuracy. The saw is clamped in carrier which feeds it through all 3 machines for retoothing, filing, setting.



FOLEY SETTER
For both hand and band saws. Sets teeth on both sides in ONE run with perfect machine accuracy.

FOLEY MANUFACTURING COMPANY • 3318 N.E. 5th St., Minneapolis 18, Minn.

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Universally used for removing stubborn, balky taps that break off deep in threaded work. Quick, easy, inexpensive. Will not damage threads.

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REDUCE TOOL CHANGE-OVER TIME

May be set for straight, right or left hand offset positions. Will hold with perfect grip any size square or round tool bit or boring bar from 1/8" to 7/16".

"REPS" PIPE & STUD EXTRACTORS

REMOVE BROKEN PIPES AND STUDS EASILY AND QUICKLY

Makes a strong, four-point grip without need for hammering or pounding. Hardened steel — will remove any material.

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B. K. ELLIOTT CO.

SCHOOL DRAWING SUPPLIES

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STATE-WIDE SUPERVISION

(Continued from page 58A)

pat on the back for their work. Unfortunately, the teachers who actually need help will not be the ones who will seek supervisory services. Thus, some industrial-arts teachers may be doing a poor job of teaching and be aware of it. Yet these teachers would hesitate to solicit supervisory services particularly from someone who may be a total stranger. Moreover, such teachers would be reluctant to admit that they are experiencing difficulty in their teaching and need assistance.

On the other hand there will be a group of teachers who may be doing a mediocre or poor job of teaching and be entirely unaware of it. Inasmuch as they do not recognize their failings, they certainly will not seek supervisory services.

The State-Wide Supervisory Program by Teacher Education Personnel

The fourth solution to a state-wide supervisory program is one in which the teacher education institutions would assume the major supervisory responsibilities. The state department of public instruction would divide the state into a number of regions and assign a specific area to each of the teacher education institutions. It would then persuade these institutions to appoint someone to their faculty who would spend his entire time supervising all industrial-arts teachers in the assigned area regardless of the institution from which the teachers were graduated. In some instances this faculty member may teach one or two classes; but for the most part, he would be devoting his time with in-service teachers. Such an arrangement would permit him to spend as much time as was necessary helping industrial-arts teachers prepare courses of study and instructional material, laying out and improving shop facilities, developing instructional aids, setting up new instructional areas, putting on demonstration lessons, and rendering such other services as are generally associated with good supervision. The very fact that this supervisor is working closely with a particular group of teachers would tend to build up a sound relationship that would be conducive to effective and efficient supervision.

It is also possible under this plan for the supervisor to keep his institution informed of the changes needed in the teacher preparation program based on observation of teachers in the field. Furthermore, all area supervisors could meet periodically to discuss teacher preparation problems concerning their respective institutions.

There are probably other favorable features of the afore-mentioned plan for state-wide supervision of industrial arts. The one significant factor under this plan is that it provides continuous services which is the type of supervision that is woefully lacking in industrial-arts programs today.

New Publications

Wood and Art Metal

By Harold O. Akeson. Paper, 62 pp., 6 by 9¼ in., illus., 85 cents. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

This interesting book contains 46 well-designed projects.

The author gives step-by-step directions for making each of these articles, and the person who makes them, be he student at school, or the hobbyist in his home shop, will be delighted with the finished pieces.

(Continued on page 84A)

8" and 6" WELDED ALL-STEEL LONG TABLE JOINTERS
HELMET HEAD DRILL PRESSES
24" x 5" HEAVY DUTY JIG SAW
SAW-JOINTER WITH TILTING ARBOR SAW
10" TILTING ARBOR SAW
HEAVY DUTY 12" x 4" THICKNESS PLANER
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(Continued from page 60A)

Woodworking — Materials and Supplies

ALCOHOL

BENZINE

BRADS — 3/8 in., 1/2 in., and 5/8 in. No. 20; 3/4 in. and 7/8 in. No. 19; 1 in. No. 18; 1 1/4 in. and 1 1/2 in. No. 16; 1 3/4 in. No. 15; 2-in. and 2 1/2 in. No. 14

CARBON PAPER — black

COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermilion

COLORS — ground, in oil or japan: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermilion

DECALCOMANIA TRANSFERS

DOWEL PINS AND PLATES

DOWELS: hardwood, 3-ft. lengths, 1/4 in., 5/16 in., 3/8 in., 1/2 in., 3/4 in.

ENAMEL
- a) Selected colors
- b) Undercoater

FILLERS — paste: natural, golden oak, dark oak, and mahogany

FILLETS — leather, 1/4 in. and 1/2 in.

GLUE
- a) Casein, hide, best grade cabinet
- b) Liquid

HARDWARE: Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
- a) And eyes
- b) Cup
- c) Screw and
- d) Square screw

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine

In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking

Hardwood, for furniture, should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
- a) Common, 6d, 8d, and 10d
- b) Flathead, 1/2 in. No. 20, 3/4 in. No. 19, 1 in. No. 18, 1 1/4 in. and 1 1/2 in. No. 16, and 2 in. No. 14
- c) Finishing, 4d, 6d, and 8d

OIL
- a) Linseed, boiled
- b) Linseed, raw
- c) Machine
- d) Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, 1/2, 1

Garnet finishing paper, 6/0, 4/0

Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
- a) Flathead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 5 by 5/8 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in.
- b) Flathead, bright, No. 3 by 1/2 in., No. 4 by 1/2 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 in., No. 8 by 1 1/4 in., No. 10 by 1 1/4 in., No. 14 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in., No. 10 by 1 3/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in., No. 12 by 2 in., No. 14 by 2 in., No. 12 by 2 1/4 in., No. 14 by 2 1/4 in., No. 14 by 2 1/2 in.
- c) Oval head, brass, No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., and No. 10 by 1 1/4 in.
- d) Roundhead, blued, No. 3 by 3/8 in., No. 3 by 1/2 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in.
- e) Roundhead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 4 by 5/8 in., No. 5 by 3/4 in.

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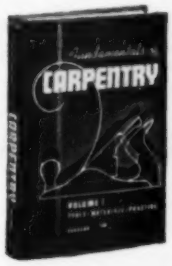

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Importance of Related Instruction to Apprenticeship

W. F. PATTERSON
Director
Bureau of Apprenticeship
U. S. Department of Labor
Washington, D. C.

The importance of related instruction in apprenticeship programs is so well known, and has been so universally agreed upon for so many years that there ought to be no question in anyone's mind on that point. It is part and parcel of every up-to-standard apprenticeship program. Assuring adequate technical instruction to apprentices is a problem of common interest to teachers, supervisors, and directors of vocational education, as well as to the Bureau of Apprenticeship, and to the state apprenticeship agencies. No apprentice is fully qualified for craftsmanship at the end of his training unless he has acquired a thorough knowledge of the technical aspects of his trade. This knowledge cannot be acquired solely on the job.

Many vocational schools have difficulties in providing this essential feature of apprenticeship, because in many communities the school facilities are not fully adequate to provide this related instruction, and there are not enough instructors. Wherever facilities are adequate, the schools are doing a superlative job.

A common problem is that of providing suitable theoretical instruction to apprentices in outlying areas; nevertheless, it is gratifying that during the past few years a great deal of progress has been made in solving it through numerous ingenious arrangements. In Utah, for example, a plan is in operation whereby itinerant instructors visit outlying localities in the state about once a month to supervise and to follow up on what has been done through correspondence courses conducted by that State's Department of Vocational Education.

Apprentice deferment regulations issued recently by Selective Service require that an apprentice, in order to be considered for deferment, must be receiving not less than 144 hours a year of related instruction. This requirement is in accordance with standards recommended by the Federal Committee on Apprenticeship and state apprenticeship agencies. Every effort should be made to provide the full 144 hours of this instruction for all young men employed in apprenticeship programs.

Another problem of top priority concern is the imperative need for uniform related instruction material in individual trades. A number of trade groups have met this need by making substantial financial outlays for compiling and distributing instruction material. These funds are often supplied individually or jointly by labor unions, employer associations, or manufacturers. The best results, however, can be obtained when this material is prepared by representatives of vocational education. It is difficult, however, to get adequate funds nationally for that purpose. Local and state activity in developing text material has been notable. Too often however it has not been physically possible to provide nationwide distribution of the material.

Regular attendance of apprentices at related instruction classes is another problem of concern to those in charge of apprenticeship programs. Experience has shown that no one needs to be concerned about the attendance of apprentices where the related instruction offered by the vocational schools is sufficiently stimulating, interesting, and valuable.

Teamwork in Apprenticeship Programs

In planning curricula, vocational educators have had the co-operation of the local joint apprenticeship committees and also of trade and industry advisory committees. This co-operation has been help-

(Continued on page 68A)

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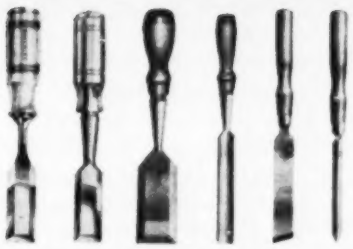

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APPRENTICESHIP

(Continued from page 66A)

ful to the schools in many localities in co-ordinating the technical instruction with the practical work in which apprentices are trained on the job. As a matter of fact, most local joint committees include on their rosters a representative of the vocational schools who serves as consultant. This is an ideal setup and should be adopted by every local committee. There are at present more than 7000 joint apprenticeship committees established throughout the United States, about half of which are in the building trades.

It is extremely heartening to note the close collaboration of those in charge of apprenticeship programs with representatives of vocational education. During recent months the writer has attended some 30 or 40 completion ceremonies in addition to other get-together meetings in various parts of the country. Among the outstanding examples of this teamwork are those at Milwaukee and Eau Claire, Wis., Evansville, Ind.; Salt Lake City, Utah; Bakersfield, Calif.; Daytona Beach, Fla.; and Savannah, Ga.

Technical Instruction in Skill Improvement Programs

Both the apprenticeship and the broad scope skill-improvement programs are co-operative enterprises in which vocational education and apprenticeship agencies are participating. Some 600 companies are now utilizing the techniques and methods recommended in the latter programs. I hear from all sources that vocational education authorities have found that the skill improvement programs have brought about a greater integration of their work and in-plant training of various kinds. These skill improvement programs, as you know, are designed to develop as required, new skills, broader skills, and technical knowledge of workers on all levels in all occupations in an industrial plant. A program may include the training of not only apprentices but journeymen, supervisors, technicians, assembly-line, and other workers, depending upon the training needs.

Many instances can be cited of how these programs are operating in a wide variety of plants and industries and the part played by vocational education in improving the skills of workers. Of particular significance has been the adoption by management and labor of procedures in skill improvement programs aimed to keep journeymen abreast of the technological changes that are occurring. An example of journeymen training was called to the writer's attention recently by the training director of one of the largest railroad companies. He came in ostensibly to tell me about the success of his company's apprenticeship program in the maintenance shops, but what he really wanted to tell me was about the benefit to journeymen of the skill improvement program that had been in operation in the railroad shops for six months. This program was necessitated by a change over from steam to diesel engines. The journeymen, it was found, needed technical instruction and job training to become proficient in the new operations that this change-over required. To provide this instruction, a two-year, step-by-step training program had been developed by the company, in co-operation with the

(Continued on page 71A)

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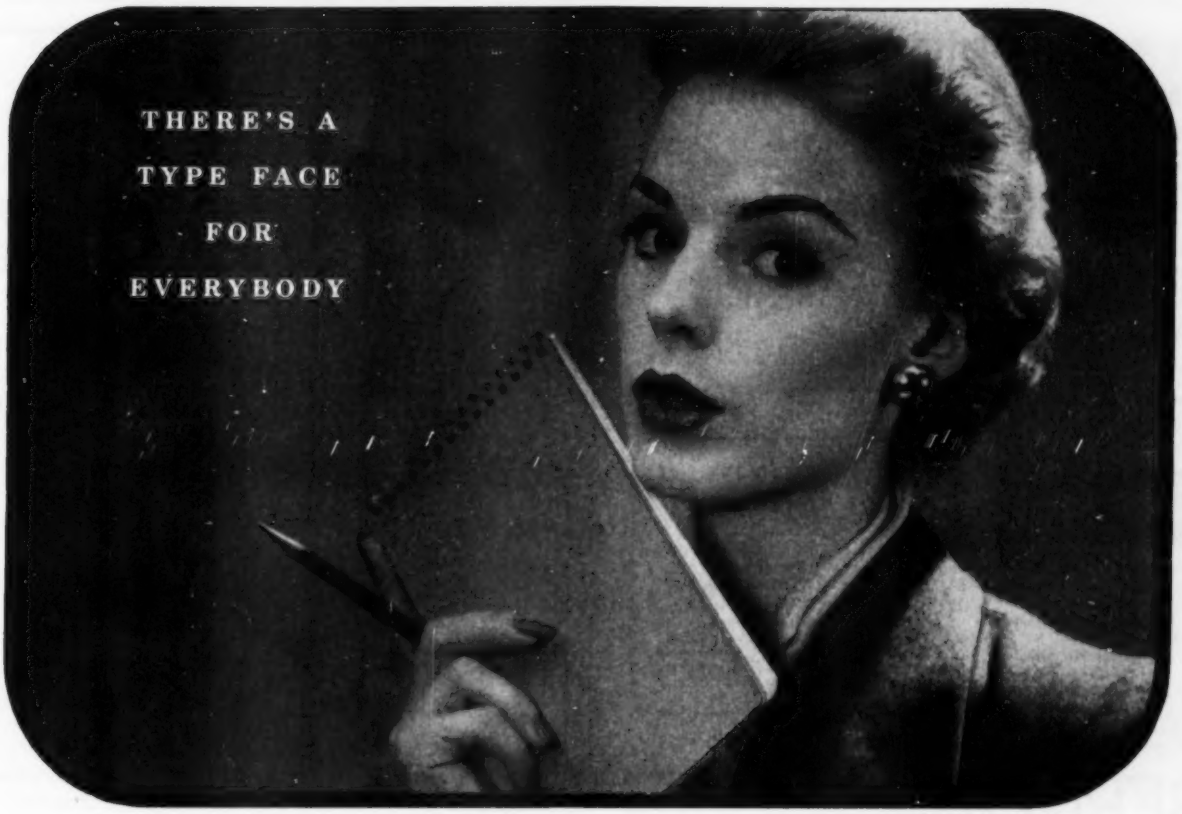

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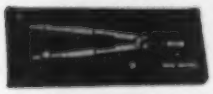

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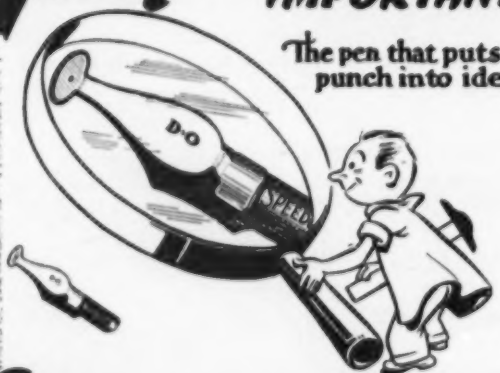

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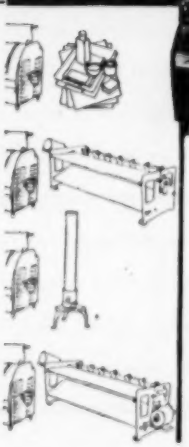

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APPRENTICESHIP

(Continued from page 68A)

labor union. Originally 75 journeymen were enrolled in this program, but so many of them felt that they needed this type of training that 50 are now on the waiting list.

Trend Toward Craftsman Careers

With the demand for apprentices today and the opportunities provided by apprenticeship, many high school graduates are choosing a craftsman's career instead of a professional or other white collar career. During recent years there have been many articles pointing to this trend.

A thought-provoking article in a recent issue of *Look* by Colgate W. Darden, president of the University of Virginia and a former governor of that state, is entitled "Too Much Education?" Mr. Darden emphasizes in the article that *noncollege bound high school students,* who are what he calls *hand-minded* as distinguished from *book-minded,* should be given a greater opportunity before graduation for vocational education. He says that those students "whose bent is toward a skill or craft rather than general learning would be much more content receiving training in apprenticeship or trade schools."

"A task becomes irksome," he says, "when it is forced upon us against our inclination. A worth-while life is the sum of satisfactions born of accomplishments."

Another article on the subject of apprentice training is that titled "Wanted — More and Better Workers in the Building Trades," which appeared in the November, 1952, issue of *Reader's Digest.* A condensation of an article in the *Kiwanis* magazine, the *Digest* article is attracting the interest of a great many potential apprentices, including high school seniors and graduates.

The article has also created a lot of interest among instructors in the schools, who are calling it to the attention of students. In reply to requests received by *Reader's Digest* the editor is distributing reprints of the condensation to the schools. The Bureau of Apprenticeship is having reprints made of the original article in the *Kiwanis* magazine, and these may be obtained by asking for them.

Other pieces of informational material that is very useful in the schools are the pamphlet "Looking Ahead by Way of Apprenticeship," and the historical booklet, "Apprenticeship — Past and Present." Both of these can be obtained from the Washington Bureau of Apprenticeship, Washington, D. C.

Skilled Workers Wanted

To get some idea of the training job ahead it is well to review briefly the nation's industrial activities, especially in the defense production program.

During the past two years there has been a large growth in our labor force and its production capacity. We have now passed the tooling up stage and the flow of military equipment is going ahead at a rapid pace. There is still much to be done, however in building up and improving the skills of man power, as well as in expanding our production facilities.

Thousands of additional craftsmen and other workers are sorely needed to produce military equipment, to build and expand defense production plants, and to build the housing for workers to be employed in the

(Continued on next page)

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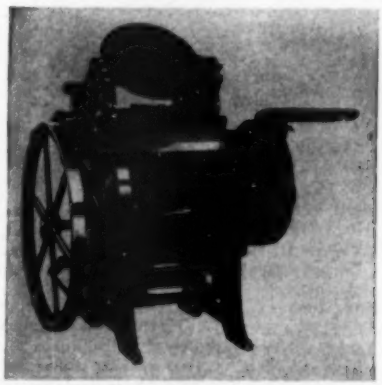


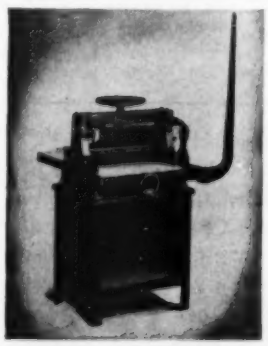
C&P NEW SERIES PRESSES These presses in sizes of 8x12, 10x15, 12x18 and 14½x22, provide the student with equipment that furnishes all practical requirements of hand fed press operation. May be equipped with flywheel, belt and platen guards. Also furnished for treadle operation instead of motor drive.

The Standard for Printing Education

C & P presses and paper cutters have been standard equipment in commercial plants and schools for over 50 years. So, the selection of C & P equipment for printing classes places before the students *practical* equipment exactly as used in commercial practice in the entire printing industry.

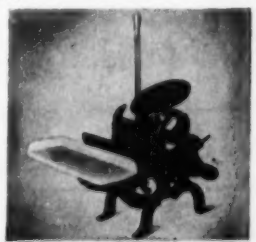
In addition, special safety features are incorporated, when desired, in C & P presses and paper cutters so that all safety requirements are fully satisfied.

For practicality—for safety—the foresighted administrator recommends . . . Chandler & Price.



C&P PILOT PRESS A thoroughly efficient little press, chase 6½x10, that teaches basic principles of press operation with exceptionally fine printing results.

C&P BENCH CUTTER An efficient, small size cutter that handles sheets up to 19" x 24". Equipped with two-handed safety control.



"HANDBOOK OF PLATEN PRESS WORK" *is one of the outstanding aids to printing furnished without charge to printing instructors. If you do not have a copy, just request one.*

THE CHANDLER & PRICE COMPANY

6000 CARNEGIE AVENUE • CLEVELAND 3, OHIO

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BELLOWS
- *a*) Hand, small size
- *b*) Electric, blower type

BLACKBOARD — permanent or portable

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
- *a*) Bench
- *b*) Benzine, No. 1, oval black
- *c*) Floor
- *d*) Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
- *a*) Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
- *b*) Galley, for 8¾ in. by 13 in. galleys, wood or steel, four tiers
- *c*) Ink and roller, to accommodate platen-press rollers, wood or steel
- *d*) Matrix, for use with typesetting machines only
- *e*) Roller, cabinet or rack for cylinder rollers
- *f*) Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
- *g*) Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copyholder
- *h*) Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
- *i*) Type, complete with 24 full-size California job cases, double work bank, wood or steel
- *k*) Wood or metal, for filing class records, instruction sheets, etc.
- *l*) Storage for cuts

CANS
- *a*) Benzine, pint size
- *b*) Benzine, 5-gal. size
- *c*) Kerosene, safety, 1-gal. size
- *d*) Waste can, fireproof, for rags

CASES
- *a*) Blank, full-size, to accommodate ¼-size cases
- *b*) Border, ¼ size, for ornamental borders
- *c*) Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
- *d*) Metal furniture, to hold laborsaving fonts
- *e*) Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHASE RACKS
- *a*) For platen presses
- *b*) For cylinder presses

CHASES
- *a*) For each size of platen press
- *b*) For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
- *a*) Lead and rule
- *b*) Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
- *c*) Paper, lever type, 26 in. or 30 in.
- *d*) Paper, lever type, 30 in., with divided back gauge
- *e*) 30 in. to 36 in. power cutter

DESK
- *a*) Bindery, 80 by 36 in.
- *b*) Drying rack
- *c*) Imposing, 51 by 39 in.
- *d*) Make-ready, 32 by 24 in.
- *e*) Paper cutters, 80 by 36 in.
- *f*) Proofreaders
- *g*) Teacher's

DRYING RACKS
- *a*) Combination drying rack and stock table for platen presses, 30 trays
- *b*) Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
- *a*) 12 by 18 in., with iron top, including reglets and furniture
- *b*) 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *c*) 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *d*) 39 by 63 in., with iron top, complete with drawers, letter boards, reglets, and furniture

INK FOUNTAINS
- *a*) Short, for 8 by 12, 10 by 15, and 12 by 18 presses
- *b*) Long, for 10 by 15, and 12 by 18 presses

KNIVES
- *a*) Overlay, for make ready
- *b*) Ink, 6 in. and 8 in.
- *c*) Ink, 8 in., square end

LEADER BOXES

LEADERS
- *a*) 6, 8, and 10 pt., fine dot
- *b*) 8 and 10 pt., hyphen

LINE GAUGES
- *a*) Metal, brass, or steel
- *b*) Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
- *a*) For use on presses
- *b*) Hand machines

ORNAMENTS
- *a*) Assorted floral and decorative designs
- *b*) Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
- *a*) 24 in., foot treadle
- *b*) 28 in., foot treadle

PLANER
- *a*) Mallets, hickory or fiber
- *b*) Proof, maple, with felt bottom
- *c*) Type, maple with leather top

PRESSES
- *a*) Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
- *b*) Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
- *c*) Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
- *d*) Platen, 12 by 18, complete with variable-speed motor, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
- *e*) Proof, 14 by 18, with cabinet
- *f*) Proof, 20 by 24, with cabinet
- *g*) Proof, 23 by 24½, with cabinet
- *h*) Tableting

PUNCH
- *a*) Foot power, multiple with assorted punches
- *b*) Lever, two die, with assorted punches
- *c*) Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
- *a*) Sizes No. 1 and No. 2
- *b*) Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
- *a*) 2 pt., laborsaving, hair line, side face
- *b*) 2 pt., laborsaving, 1 pt. side face
- *c*) 1 pt., laborsaving, 1 pt. face
- *d*) 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
- *a*) Iron furniture, as selected
- *b*) Leads, laborsaving, 2 pt.
- *c*) Leads, 2-ft. strips, 2 pt.
- *d*) Slugs, laborsaving, 6 pt.
- *e*) Slugs, 2-ft. strips, 6 pt.
- *f*) Spaces and quads
- *g*) Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ in. or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
- *a*) 18 in.
- *b*) 38 in., upright, to be used with cylinder press only

TYPE
- *a*) Body, lightface — 8 and 10 pt.
- *b*) Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
- *c*) Job, lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
- *d*) Job, boldface — 6 and 8 pt., 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
- *e*) Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
- *f*) Job, condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
- *g*) Job, text type — 10, 12, 14, 18, and 24 pt.
- *h*) Job, typewriter type — 12 pt. with spaces
- *i*) Job, boldface Italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
- *k*) Job, heavy copperplate Gothic

(Continued on page 74A)

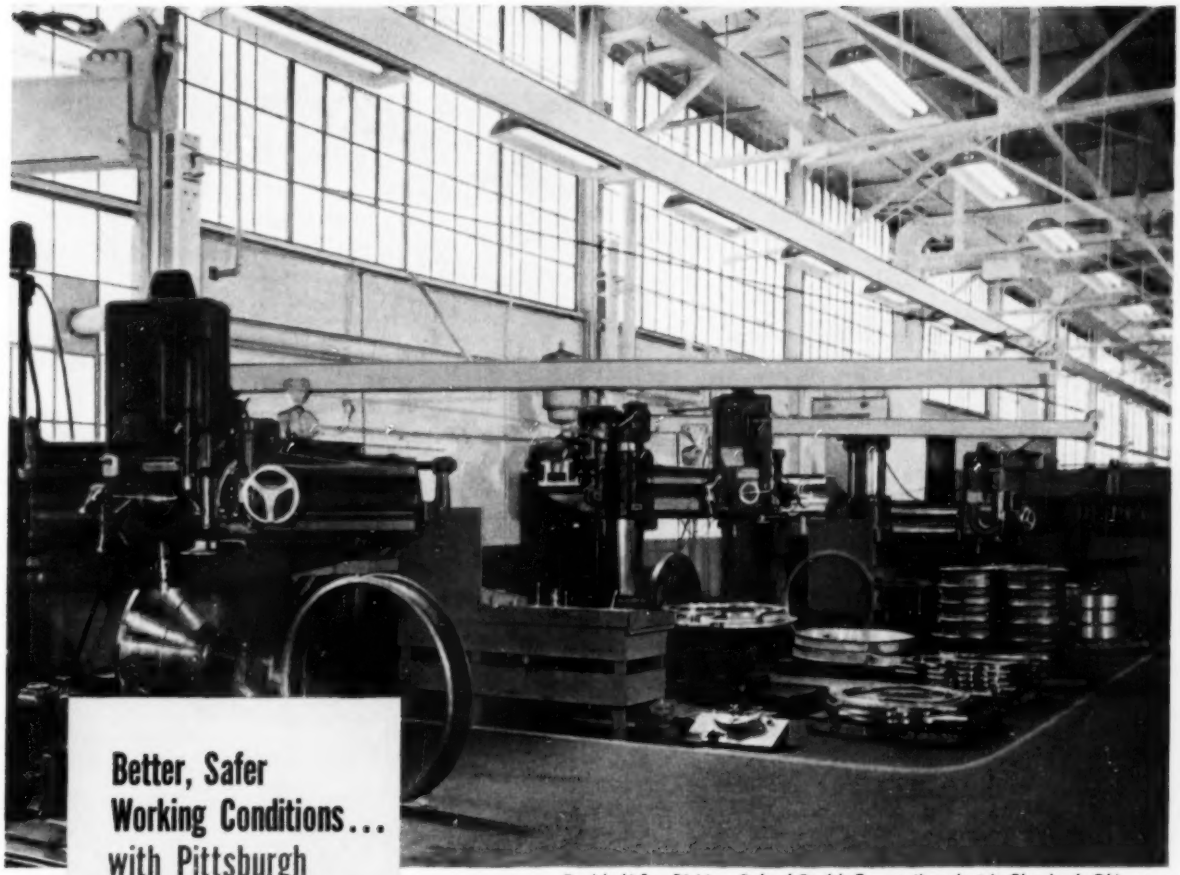
APPRENTICESHIP

(Continued from previous page)

plants. There is a serious shortage of craftsmen in about 30 skilled trades listed as critical by the Secretary of Labor. The greatest shortage has been — and still is — for skilled workers in the machinist, tool- and diemaker, aircraft mechanic, electrician, and foundry trades.

Although the number of apprentices in training in the critical trades is far short of the quota needed to meet the skilled man-power demand, a good deal of progress has been made toward alleviating these shortages. The number of apprentices being employed in other trades is far from encouraging, however. Despite the demand, there has been a decline during the past two years in the number employed. This decline has not been because of any complacency on the part of employers nor of the unions. It is owing largely to the induction into military service of so many apprentices and potential apprentices, difficulty in finding enough young men qualified for apprenticeship, and in keeping those employed on the job until they have completed their training. Fortunately we

(Continued on page 78A)



Fawick Airflex Division, Federal Fawick Corporation plant in Cleveland, Ohio, uses COLOR DYNAMICS to give workers more pleasant and cheerful surroundings.

Better, Safer Working Conditions... with Pittsburgh COLOR DYNAMICS*

Why tomorrow's shopmen must know how to use this modern painting system to improve productivity, efficiency and morale of workers.

*Trade Mark Reg.

FAWICK Airflex

TRAINING of skilled shopmen is no longer confined to teaching them about metals, machinery and methods. It includes study of the influence of color upon workers and their output.

• **That's why** vocational education today often includes Pittsburgh COLOR DYNAMICS in its curriculum. Educators recognize that greater knowledge and more widespread use of this method of painting is making important contributions to the productivity and welfare of employees.

• **Shopmen in thousands** of plants are finding that color properly "engineered" on walls, ceilings, floors and machines is improving efficiency and morale.

• **Eye-rest colors** on walls and machines help workers to see their jobs better. Eye fatigue, often the cause of lowered efficiency, is lessened. Morale-building colors improve the workers' mental attitude toward their jobs. Safety colors warn them of danger areas and cut down time-loss accidents.

• **If you want your students** to be better equipped for future tasks, begin now to teach COLOR DYNAMICS. Better still, demonstrate its principles in a practical manner. Apply them in the decoration of classrooms and equipment—and see the difference.

We'll be glad to make a color engineering study for you — FREE

• For a practical demonstration of the benefits of COLOR DYNAMICS, paint walls, ceilings and machines of your vocational study rooms according to this system. We'll be glad to make a free color engineering study for you. Call the Pittsburgh Plate Glass Company branch nearest you and arrange to have a color expert see you at your convenience. Or mail this coupon.

SEND FOR THIS FREE BOOK!

Pittsburgh Plate Glass Co., Paint Div.
Department 4A-34, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "*Color Dynamics*."

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PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

(Continued from page 72A)

— 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
l) Wood, condensed Gothic — 8, 12, 15, and 18 line
m) 10 pt. line leaders, 4 dots to the em
n) 10 pt. braces and dashes
o) 10 pt. fractions
p) 10 pt. references
q) Parentheses and brackets
r) 2 pt. laborsaving leads, 4 to 25 picas
s) 6 pt. laborsaving slugs, 4 to 25 picas
t) 2 pt. laborsaving brass rule
u) 2 pt. miters for rule
v) Laborsaving metal furniture
w) Thin spaces with quarter-size case

TYPESETTING MACHINES
a) Either linotype or intertype, 2 or 3 magazines, and molds
b) Matrices for same, 6, 8, 10, and 12 pt., as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses
BINDERY TAPE — 2 in. wide, brown or black
GOLD BRONZE — pale
INK
a) Bond, black, for bond papers
b) Book, black, for school papers, etc.
c) Cover, colors as selected
d) Dryers and compounds, as selected
e) Half tone, black
f) Job, colors as selected
g) Metallic, gold and silver
h) Process, black, red, yellow, blue

KEROSENE — for cleaning rollers
PADDING CEMENT
a) Cold
b) Hot

PAPER
a) Bond, fine grade, 17 by 22 — 20, white
b) Bond, medium grade, 17 by 22 — 20, white
c) Bond, sulphite, 17 by 22 — 20, white
d) Bond, sulphite, 17 by 22 — 20, colors as selected
e) Book, enamel, 25 by 38 — 80, white
f) Book, machine finish, 25 by 38 — 80, white
g) Book, eggshell finish, 25 by 38 — 60, white
h) Cover, as selected, 20 by 26, medium
j) Card Bristol, fine grade, 22 by 28 — 4 ply, white
k) Index Bristol, medium grade, 25½ by 30½ — 110, white
l) Index Bristol, medium grade, 25½ by 30½ — 140, white
m) Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
n) Pressboard, red
o) Strawboard, No. 40 or No. 50
p) Tagboard, manila, 24 by 36 — 140
q) Tympan, to fit presses
r) Wrapping paper, size as selected
s) Holder for same

PASTE
a) Bindery
b) Make ready

SILK-SCREEN SUPPLIES consisting of:
a) Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
b) Solvent profilm in 11- by 14-in. sheets
c) 8-in. synthetic squeegee
d) 11-in. synthetic squeegee
e) No-clog varnish
f) Film solvent
g) Stencil filler
h) Filler remover
j) Stencil knife
k) Fiber guides
l) Red sable brush — ½ in.
m) Putty knife
n) Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
a) No. 28 round wire for stitcher
b) Wire staples, ¼ in.

Drafting Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER
BEAM COMPASS
BENCH BRUSHES
BLACKBOARD
a) Permanent or portable
b) Compass, 15 in., with locking device
c) Drawing set: T square, straightedge, triangle, and protractor

BLUEPRINT
a) Frame or machine
b) Washing trays or washer
c) Paper tube, airtight
d) Drying rack or dryer

BOOKCASE
CABINET
a) For filing drawings

(Continued on page 76A)

6 books every artist will want...each a specialized "course" in itself!

TECHNICAL ILLUSTRATION
Emphasizes 3-D and perspective drawing so much in demand today. Clear, easy-to-understand text and illustrations by experts. **Only $2.50**

COLOR DIGEST
Practical help and inspiration for everyone who uses color in any profession or hobby. Includes all parts for assembling an Ostwald Solid, with full instructions. **Only $2.00**

TECHNIQUES
5th Edition. 48 fascinating pages loaded with practical "how-to-do-it" information and 308 striking illustrations. Gives you the groundwork and advanced techniques for all types of ink drawing: pen, brush, wash, scratchboard, spatter and stipple techniques. **Only $1.25**

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2nd Edition. 56 pages, profusely illustrated. 34 distinctive type and script alphabets. Also type faces and manuscript engrossing, with large illustrations. **Only $1.25**

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A complete study of all aspects of this fascinating subject; gives you the "know-how" of scores of top-notchers in the field. Hundreds of illustrations. **Only $1.25**

PROJECTS
60 big pages on Textile Dyeing, Map Making, Paper Decorating, Book Binding, Spatter and Airbrush Work and suggestions to give pleasure and satisfaction to all arts and crafts enthusiasts. **Only $1.25**

By the makers of the famous Higgins American Drawing Inks

All six books, attractively boxed, only $9.00

AT ART SUPPLY STORES EVERYWHERE

HIGGINS INK CO., INC. BROOKLYN, NEW YORK

TURQUOISE GRADING *is tried and true!*

A test pencil is first weighted to average drawing pressure and inserted in this exclusive Eagle Shading Machine. The machine then moves a sheet of paper back and forth beneath the point. Because all other factors are equal, the blackness of the shading depends solely on the trueness of the pencil grade.

The chart prepared by the Shading Machine is then placed under the electric eye of this Reflectometer calibrated to black and white glass standards. The sensitive dial indicates the blackness of the shading to a fraction of one percent . . . and *proves* the test pencil true to grade!

Because each of the 17 TURQUOISE grades is made from a separate formula . . . and because each grade is both *tried* and *true* . . . TURQUOISE will give you exactly the line you want every time!

PROVE IT YOURSELF. Write us for a sample of the new TURQUOISE in any degree you desire. Please name this publication.

EAGLE *"Chemi-Sealed" (Super Bonded) TURQUOISE *Drawing Pencils & Leads*
With 100% *"Electronic" Graphite

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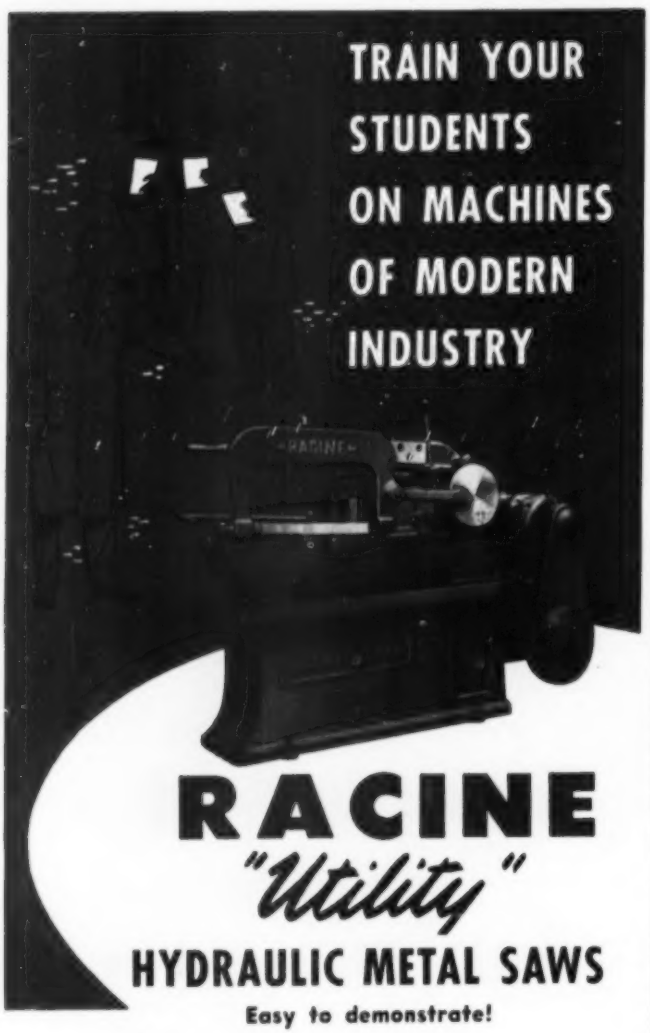


Here's the ideal metal-cutting saw for vocational training . . . ideal because it is the same type machine used by modern industry . . . ideal because it requires only minimum maintenance.

VERSATILE — Racine's "Utility" metal-cutting saw is a durable performer in all metals from soft tubing to hard alloy steels up to 6" x 6". Available in Wet or Dry Cut models.

ACCURATE — ECONOMICAL — Assures important savings in materials and blades.

STURDY — Built to "take it" . . . in industry and in the school shop.

EASY TO OPERATE — Hydraulic operation provides simplified, trouble-free operation. Pressures are controlled by single graduated dial.

PROVEN — The first choice of leading schools and industries, backed by more than 4 decades of progressive experience in the manufacture of precision machines for training and industry.

Write us about your training machinery needs. Also ask for our complete metal saw line catalog. Address RACINE HYDRAULICS & MACHINERY, INC., 2080 Albert St., Racine, Wis.

RACINE

(Continued from page 74A)

- *b*) For storing drawing boards
- *c*) For storing drawing instruments
- *d*) For storing models

CALIPERS — 6 in. and 8 in., inside and outside
CHAIR — teacher's
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
DRAFTSMAN'S STEEL PROTRACTOR
DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
DRAWING TABLES AND STOOLS
- *a*) For students
- *b*) For teachers

INK-BOTTLE HOLDER
IRREGULAR CURVES — Nos. 17, 21, and 24, wood, rubber, or transparent
LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETERS
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
- *a*) For cutting and trimming drawings and blueprints
- *b*) For disassembling and reassembling machine parts and models

TAPELINE
- *a*) 100 ft., steel, for architectural students
- *b*) 50 ft., steel or metallic

TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
- *a*) 30–60 deg., 14 in. transparent
- *b*) 45 deg., 10 in. transparent

TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing boards
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK
To be provided by, or for, each student

Drafting — Small Equipment

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architects', triangular
SCALE GUARD
SLIDE RULE — 10 in., as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30–60 deg., 10 in. transparent, and 45 deg., 8 in transparent

Drafting Supplies

BICHROMATE OF POTASH — crystals
BLUEPRINT
- *a*) Paper, 36 in. wide
- *b*) Writing fluid

PAPER
- *a*) Cross section, 8½ by 11 in.
- *b*) Detail, 24 by 36 in.
- *c*) Drawing, 24 by 36 in.
- *d*) Isometric, 7 by 10 in.
- *e*) Tracing, 36 in.

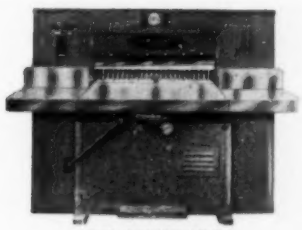
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
- *a*) Fixing salts
- *b*) Paper, 36 in.
- *c*) Writing fluid

Drafting — Additional Supplies

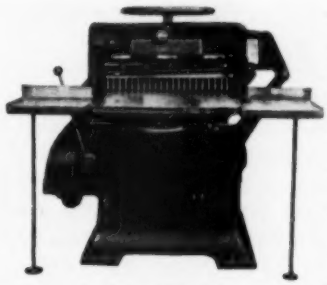
To be provided by, or for, each student
ERASERS
- *a*) Cleaning
- *b*) Ink
- *c*) Pencil

INK
- *a*) Black, waterproof
- *b*) Colored, if required

PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE



370 AUTOMATIC



DIAMOND HAND CLAMP

HI-SPEED QUOIN

Saves up to 80% lock up time. Self-contained . . . direct expansion . . . no reglets . . . no work-ups.

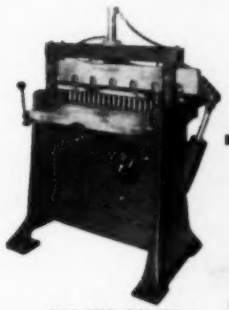
QUOINS

CHALLENGE QUOIN

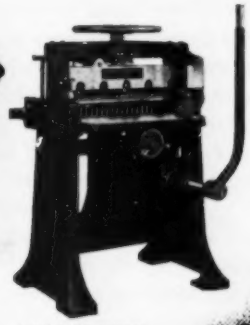
3 sizes — dwarf, small and large. Beveled heels and points. Guaranteed keys.

CUTTERS

8 styles and 6 sizes. Ranging from lever cutters in bench and floor models to the new automatic cutter with hydraulic clamp.



265-305 POWER (HYDRAULIC CLAMP)



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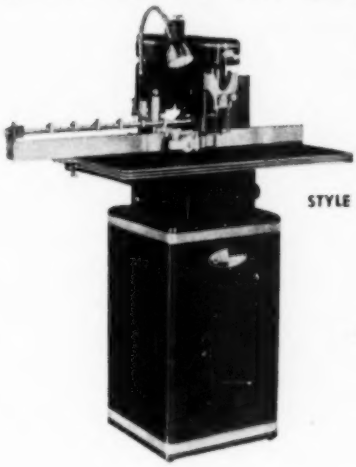
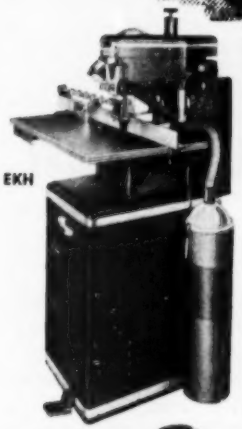
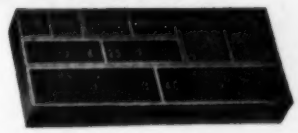
dependable CHALLENGE PRINTING EQUIPMENT AND MACHINERY



STYLE E



STYLE EKH



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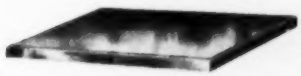

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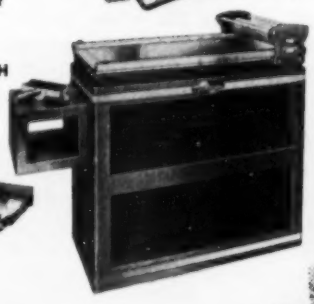

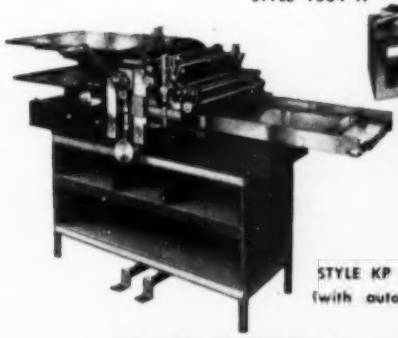

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APPRENTICESHIP

(Continued from page 77A)

now have the advantage of apprentice deferment which should — to some extent at least — alleviate the situation. We also have the advantage of the newly enacted G.I. Bill, which should make available many more veterans for apprentice training. Although neither the G.I. Bill nor apprentice deferment will do away with all of our difficulties in providing the skilled workers needed, the picture is far brighter than it has been for some time.

To accomplish the training job ahead, industry will need all the assistance that can be provided by the apprenticeship agencies and vocational education.

Construction Industry

The enormous workload of the construction industry is calling for thousands of additional craftsmen. In addition to the home building program, which shows little sign of slackening off, is the plant building program that is now going forward.

Despite the progress that has been made in the development of craftsmen through apprenticeship, not nearly enough apprentices have been trained to provide for the skilled man power needed in this industry.

Among the plant building jobs now under way is the billion-dollar Savannah River Project of the Atomic Energy Commission in South Carolina. To provide for the skilled construction men needed there, an area-wide apprenticeship program has been started. It is a joint contractor-labor program with a general committee directing the program. Joint committees have been set up in each trade in which apprentices are employed.

An even larger project has been scheduled by the Atomic Energy Commission in Pike County, Ohio. Huge gaseous diffusion plants costing an estimated one billion, two hundred million dollars, are to be built in that part of the state. Fully 27,000 on-site workers will be needed there before September, 1954. In the sheet-metal trade alone approximately 2800 journeymen will be needed for the Pike County Project. Unquestionably it will be necessary to conduct an apprenticeship program on the property to develop the craftsmen who will be required.

With regard to residential construction, 966,400 new permanent nonfarm dwelling units have been started so far in 1952. A total of 917,500 new private housing units have been started — 29,100 more than in December, 1951. Also 48,500 public housing units have been started thus far in 1952.

Judging by this brief summary, it is evident that the need for training in the construction industry as well as in the manufacturing industries is almost unparalleled. The tremendous job can be accomplished, however, through the co-operation of employers and labor, and the assistance assured by vocational education representatives and the public apprenticeship agencies.

Public Relations in Industrial-Arts Education

CARL E. FRANKSON
Chairman, Department of Industrial-Arts Education
New Jersey State Teachers College
Newark, N. J.

The term *public relations* is often used and thought of as being synonymous with publicity. It is wise, therefore, to define the term before discussing its relation to the area of industrial-arts education. The following definition is from the 1950 Yearbook of the American Association of School Administrators:

> School public relations is the co-operative development and maintenance of efficient two-way channels of information and understanding between the school, its personnel, and the community.

Stated in a simple manner, public relations is the art of working effectively with people. It is a two-way street, a co-operative venture. It seeks to channel ideas and information from the public to the school as well as from the school to the public. Friendliness and thoughtfulness are the beginning and the end of good public relations.

Where Do Public Relations Begin?

Whether the industrial-arts department has a public relations program or not, it does have public relations, good or bad. The object of a planned program is to insure that the relationships of the school with its public will be good.

Whether the industrial-arts teacher has a planned program or not, public relations begin with his pupils. What they say and how they react to his laboratory offerings and his school is very important. A well-oriented and happy pupil is the best asset to the public relations program.

If rapport exists between the pupils and their teachers, it may well indicate friendly and trustworthy relationships which should be basic to any public relations program. The pupil who has a warm feeling toward the instructor, is far more likely to discuss not only class problems but life problems with him. This genuine understanding is basic to good teaching.

Another very important relationship is that of teacher-to-teacher. Where people work harmoniously with each other, the spirit and morale is usually contagious. Every teacher in the school system owes loyalty to his fellow staff members and to the administration. When speaking about another staff member or administrator he should praise or reveal good qualities. Any personal remarks which would degrade an-

(Continued on page 81A)

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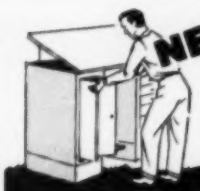

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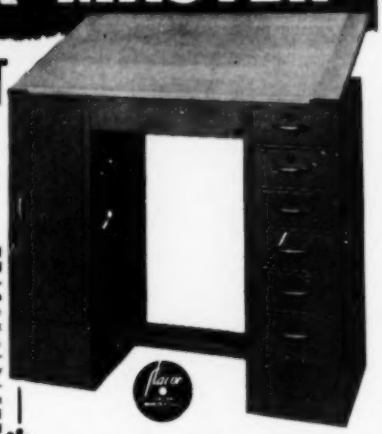

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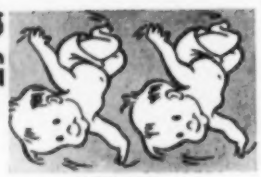

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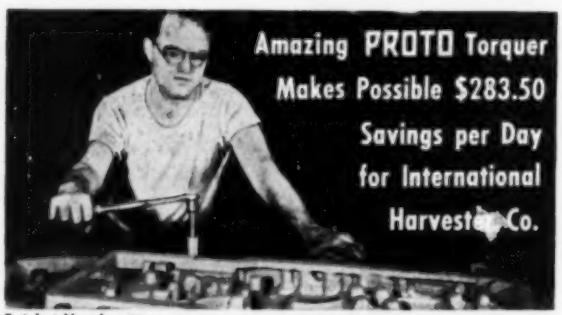

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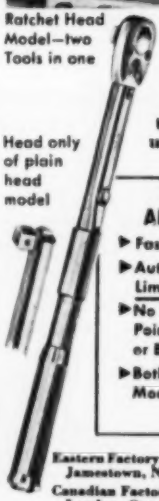

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PROTO TOOLS

PUBLIC RELATIONS

(Continued from page 78A)

other teacher would also degrade him in the eyes of the student. This loyalty is basic in a good program of public relations.

The teacher should be thought of as being a human being, a citizen, and a teacher. The teacher-community relationships should be considered as a part of the program. The teacher who is active in social and civic life in his community can do much to increase the understanding and prestige of his school.

The best public relations of the industrial-arts teacher and his school, in the final analysis, will depend to a great extent upon good teaching and good scholarship, for these there is no substitute.

Who Are the Publics?

Every society is composed of individual groups, each having specific objectives and working toward goals. We have referred to these groups as "publics." The industrial-arts public relations program should be interested in all of these publics which would include, to name but a few, pupils, teachers, secretarial and service staff, parents, civic groups, service clubs, press, radio, and television.

General Techniques to Be Employed in the Industrial Arts

The industrial-arts teacher himself is always a focal point for his public relations program. He should dress neatly and be well groomed. Children are very responsive to personal dress and habits. He should be friendly and sociable in his school and his community. This last statement infers that the teacher should live and act the part of a leader as well as a teacher.

Loyalty to himself, his pupils, his fellow teachers, and to his profession is of paramount importance. One industrial-arts teacher that I know eats lunch with his pupils one day a week in his laboratory. Common pupil problems are discussed as well as world events. At this time the instructor endeavors to have his pupils understand and appreciate the work of others. Mutual understanding and loyalty cannot fail to result from such a personal approach.

Professional Techniques to Be Employed in Industrial Arts

The industrial-arts laboratory should be so well arranged and attractive that pupils will have a desire to work in it. The work experiences should be based upon well-designed and functional projects that will challenge the abilities of the pupils. We should bear in mind that every experience should be planned so as to result in success. This means that class standards should be set as high as the abilities of the pupils will allow.

The new and inexperienced industrial-arts teacher in many cases will establish too many set rules for procedure and discipline. If a democratic atmosphere is to prevail in the laboratory, the neophyte teacher must work closely with the children in formulating these procedures and discipline routines. When the occasion demands that rules be set up, the pupils should help in their formation. Once established, it is the duty of the teacher to insist on them being followed. The teacher should be firm, fair, and friendly at all times. The personnel organization of the laboratory is not only democratic but is a must in any well-organized laboratory.

The instructor should watch for special interests and aptitudes and help pupils develop them. The personal and social needs of all pupils differ. The program by necessity must allow flexibility to provide for these individual needs. Above all remember that you are teaching children and not a course of study!

(Continued on next page)

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PUBLIC RELATIONS

(Continued from previous page)

Specific Techniques to Promote the Public Relations Program

Specific techniques should be used by the teacher to promote his public relations program. One of the most used techniques perhaps is that of exhibits. These are two types. The first may be referred to as *static*. The shop projects are arranged in display fashion in the shop, in a large room, or in the gymnasium. The public is invited to view and examine these projects. The second type may be called *dynamic*. This type differs from the static in that regular classes are held in the evening, usually from six to seven or seven thirty p.m. The public is invited to see the children at work doing regular classwork. This will afford all of the opportunity of seeing the youngsters at work in a daily school-laboratory atmosphere. Sometimes pupils will arrange demonstrations showing some specific industrial process, or how something is made. These demonstrations may include work in such representative areas as, lapidary, silk screening, jewelry making, etching, bookbinding, or leatherwork. Some projects which have been completed may also be exhibited at the same time. Children in action, however, adds the human element to functional learning and should be considered as the finest technique to promote public relations.

The industrial-arts teacher should always be aware of club gatherings where he may speak, show slides of the work done by his classes, or arrange exhibits of schoolwork. Short compact talks and the showing of slides to such organizations as the Parent-Teacher Association, Rotary, or Chamber of Commerce will aid these groups in getting better acquainted with their schools.

Newspapers are always looking for feature stories which have local settings. Good stories accompanied by good photographs representing such work as club or class contests will be of interest to local taxpayers.

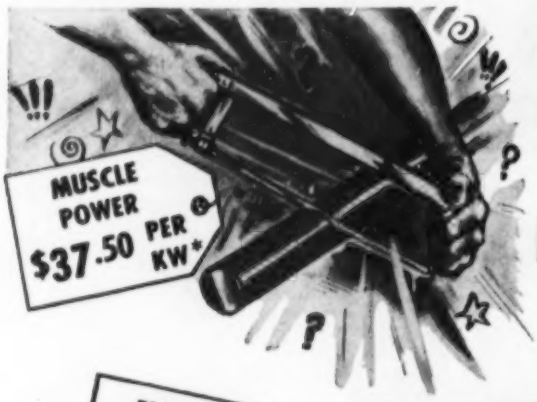
Radio and television programs featuring certain phases of industrial-arts education is one of the finest techniques which can be used to promote public relations. The young men of our College promoted such a program in Newark, N. J. The men rehearsed for weeks before going on the air. The moderator did so well that a vice-president of the station rushed to the studio to offer the young man a contract!

The program may also be promoted within the school itself. Many fine programs have been presented at school assemblies. Panel discussions concerning the value of industrial arts or demonstrations related to industrial manufacture may be made interesting to the pupils. Often talks by one or more pupils, using slides or charts may be featured. Of course, showcases located in the corridors of the school also may be used to good advantage in promoting the program.

Adult classes in industrial arts have increased in popularity a great deal in the past few years. This is one of the finest vehicles for public relations. Many of the adults will be taxpayers who have children in the school. A firsthand experience in the laboratory will undoubtedly help the adults better to understand the needs and aims of the teacher and his program.

A comparably new technique was inaugurated at the Iowa State Teachers College after the war. The schools and the local Chamber of Commerce arranged exchange dates for visiting. A certain day was set aside for all children to visit local industries. Industry planned this visit with a view to aiding the students in under-

(Continued on page 84A)



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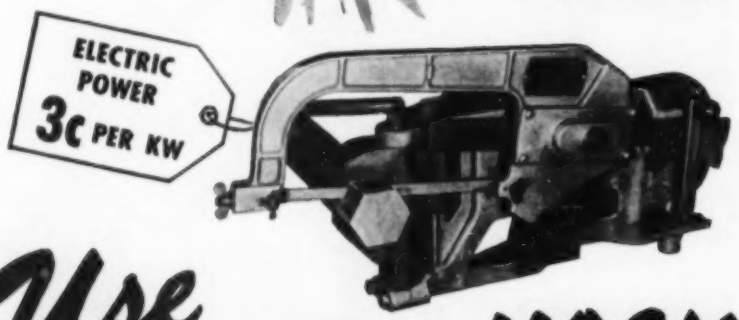

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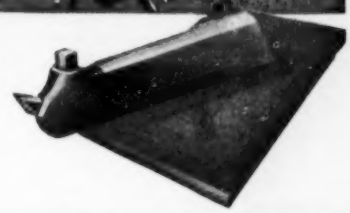

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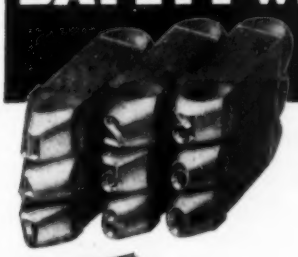

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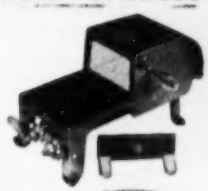

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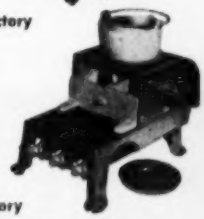

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PUBLIC RELATIONS

(Continued from page 82A)

standing the problems encountered by the workers concerned in manufacturing goods. The schools also did what they could to show the work of the school as well as the problems they faced in educating the youth of the community.

The interchange of visits undoubtedly will help all concerned to understand their problems and their community better.

One school in the metropolitan area of Newark had been working and promoting safety for years. One day the industrial-arts supervisor conceived the idea that outside help would be desirable in reorganizing his laboratories. He asked three prominent safety engineers who were employed by large companies to help him with his problem. They met in the various schools and offered many valuable suggestions. These men not only were pleased to help, but spoke to acquaintances of influence who later contributed materially in promoting new machines and supplies for these laboratories. Make use of the men in your community to help you promote your industrial-arts program.

Last but not least, be a superior teacher. Plain ordinary good teaching is not enough. If you want the pupils to go home and rave about the values of an industrial-arts program, you have to do an excellent job of teaching. Remember there is no substitute for superior teaching in building public relations in your community.

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NEW PUBLICATIONS

(Continued from page 63A)

General Shop

By Chris H. Groneman and John L. Feirer. Cloth, 307 pp., 6¾ by 9½ in., illus., $3.56. McGraw-Hill Book Co., Inc., New York City.

An excellent text for general shop subjects.

Its eight sections, devoted as they are to drawing and planning, woodworking, metalworking, electricity, plastics, leathercraft, home maintenance, and projects, cover the subjects requested by 98 per cent of the 500 teachers who were canvassed before the book was planned and written.

Each section has its discussion topics and suggested problems. Each project has its detailed working drawing and a photographic or pictorial illustration of the finished project.

This text, while primarily written for teachers of the general shop, will be equally useful for classes in which home maintenance, occupational therapy, arts and crafts, and hobby subjects are taught.

Instructional Units in Machine Shop

By Oscar A. Embretson and Henry J. Seymour. Paper, 63 pp., 8½ by 11 in., illus., 96 cents. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

This very helpful text aims to help the student to acquire a good understanding of the principles and practices which underlie the work done by the machinist.

It contains 20 well-written and illustrated jobs the end results of which are well-designed useful tools and objects which the student can use, and which help him to acquire the skill and knowledge demanded of a good machinist.

The book also contains tests for each of the five units into which it is divided, and a final examination to help the teacher and the student to check how well the course has gone across.

There is also a student progress record, a number of supplementary projects, a glossary of machine-shop terms, and some very useful tables.

Developing Farm Woodlands

By John Frederick Preston. Cloth, 386 pp., 6¼ by 9¼ in., illus., $4.50. McGraw-Hill Book Co., Inc., New York City.

A fine text for students of agriculture, and for farmers who want to make a profit out of their woodland. It describes how to plant, weed, thin, prune, and cut the trees for the market.

The ten chapters explain in understandable terms how to start a farm forest; weed and thin the tree crops; prune, cut, and market the wood crop, and wood products; manage the woods for maple sap, Christmas trees, and naval stores.

The appendix contains a glossary, volume tables, log rules, and a summary of forest taxation laws by states.

The book is well illustrated.

Television and Radio Repairing

By John Markus. Cloth, 556 pp., 6¼ by 9¼ in., illus., $6. McGraw-Hill Book Co. Inc., New York 36, N. Y.

This text aims at helping the beginner acquire both the technical information and the skill re-

(Continued on page 88A)

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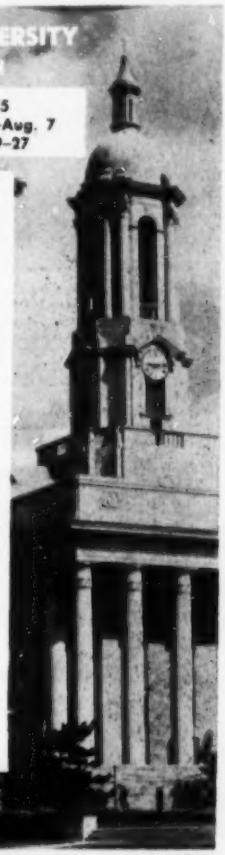

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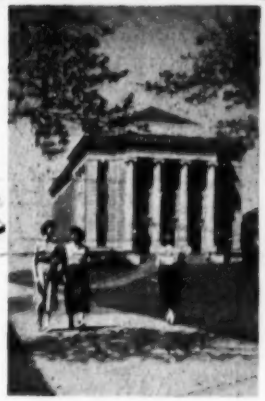

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- *c*) Fine red sable
- *d*) Glaze

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CERAM-INK

CERAMIC DECALS

CERAMIC PENCILS

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- *b*) Flint
- *c*) Gum arabic
- *d*) Kaolin
- *e*) Kiln patching cement
- *f*) Kiln wash
- *g*) Metallic oxides
- *h*) Opax
- *i*) Plaster of Paris
- *j*) Plaster separator
- *k*) Silicate of soda
- *l*) Soda ash
- *m*) White lead
- *n*) Whiting
- *o*) Zircopax

CLAY
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- *b*) White modeling
- *c*) Fine white flower making clay
- *d*) Porcelain

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GLAZES
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- *b*) Crackle
- *c*) Cold
- *d*) Luster
- *e*) Majolica
- *f*) Matt
- *g*) Overglaze, various colors
- *h*) Platinum
- *i*) Under and overglaze mediums
- *j*) Underglaze, various colors

JARS — Pints and quart for storing glazes

KILN FURNITURE
- *a*) Plate rack
- *b*) Posts
- *c*) Spurs
- *d*) Standard stilts
- *e*) Star stilts
- *f*) Tile setters
- *g*) Triangles

KILNS

KILN SHELVES
- *a*) Full
- *b*) Part

MODELING TOOLS
- *a*) Boxwood
- *b*) Fine-art plaster working
- *c*) Lace tools
- *d*) Moss decorator
- *e*) Plaster
- *f*) Sgraffito
- *g*) Slip tracers
- *h*) Wire loop

PITCHERS
- *a*) Large — slip pouring
- *b*) Small — glaze pouring

PLASTER-OF-PARIS MOLDS
- *a*) Animals
- *b*) Ash trays
- *c*) Book ends
- *d*) Candleholders
- *e*) Candy dishes
- *f*) Cigarette boxes
- *g*) Dishes
- *h*) Figurines
- *i*) Flowerpots
- *j*) Lamp bases
- *k*) Mugs
- *l*) Novelties
- *m*) Planters
- *n*) Salt and pepper shakers
- *o*) Trays
- *p*) Vases

POTTER'S WHEEL
- *a*) Electric — constant speed, variable speed
- *b*) Kick

SCALES

SIEVES OR STRAINERS — 30 mesh, 50 mesh, 80 mesh

SPONGES
- *a*) Cellulose
- *b*) Elephant ear

SPRAY BOOTH
- *a*) Blower
- *b*) Filters
- *c*) Mask for spraying

SPRAY GUNS
- *a*) Electric
- *b*) Hand

TURNING TOOLS
- *a*) Finishing rubbers
- *b*) Rib
- *c*) Right- and left-hand
- *d*) Scrapers
- *e*) Wire

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NEW PUBLICATIONS

(Continued from page 84A)

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How to Use Signal and Sweep Generators

By J. Richard Johnson. Paper bound, 144 pp., 5¾ by 8¼ in.; list price, $2.10. John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

This book is written for the practical radio and TV technician, the student of electronics, and all others who desire a familiarity with these equipments.

It is the first book in the "How to Use" series to devote itself entirely to all types of signal generators. The book explains the equipment as well as the applications of AM signal generators, FM signal generators, test oscillators, marker generators, sweep generators, and calibrators. It discusses the problems involved in using this equipment and how to overcome them.

Automotive Mechanics

By Joseph Heitner. Cloth, 501 pp., 6¼ by 9¼ in., illus., $4.60. D. Van Nostrand Co., Inc., New York, N. Y.

A text for beginners in the study of auto mechanics. The book contains eight teaching units each covering a complete division of the automobile.

The units can be taken up with the student in any rotation desired. They are well illustrated and take up the history of motor vehicles, the power unit, bearings, and lubrication, the fuel system, cooling system, electrical system, the power train, and the running system.

The book also contains 15 trouble-shooting charts.

Elements of Electrical Engineering

By Arthur L. Cook and Clifford C. Carr. Cloth, 682 pp., 6 by 9¼ in., illus., $6.75. John Wiley & Sons, Inc., New York, N. Y.

This is the sixth edition of this text which expounds the principles and practices of electrical engineering. This new edition presents a thorough revision. More than half of the text has been rewritten; and many new illustrations and problems have been added.

The chapter on electronics also has been enlarged.

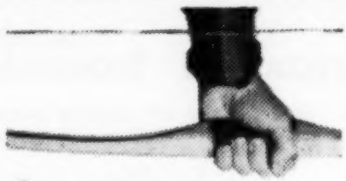
The authors have tried to make the text as flexible as possible and they indicate additional chapter sequences that may be followed.

News Notes

MARSHALL BYRN MEMORIAL LIBRARY

To perpetuate the memory of Marshall Byrn, who devoted his lifetime to teaching industrial arts at the University of Michigan, Ann Arbor, Mich., a curriculum library and study center has been established in the University laboratory schools. This library has been made possible through the many donations to the Marshall Byrn Memorial Fund by friends and associates.

The library will contain many of the current texts and reference materials on industrial arts. The study center is equipped with comfortable



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chairs and study tables, facilities for shop planning, and equipment for reviewing current films and filmstrips. This library will be the home and study center for graduate and undergraduate students of industrial arts at the University of Michigan.

Industrial-arts teachers, supervisors, and administrators are invited to visit and use this library when in Ann Arbor. The purpose of this facility is to serve the industrial-arts teachers.

♦ "Why I Teach," a contest for teachers, to encourage good teachers to remain in the teaching profession, and eligible young people to enter it, is again being sponsored by the American Legion Auxiliary. The contest opened November 1, 1953, and closes at midnight May 1, 1954.

Mrs. Carl W. Zeller of Gibsonburg, Ohio, National Security Chairman of the American Legion Auxiliary, said that contestants must have completed five years of teaching by June 1, 1954, and that each entry must be accompanied by a signed statement of release, giving the American Legion Auxiliary permission to use the entry.

The subject of this year's contest is, "The purposes and goals of a teacher in a free America." The form of the essay must be an open letter to a high school graduate, and the entry may not exceed 300 words, and not be less than 100.

Both divisional and national awards will be given. The divisional awards will consist of a $50 U. S. savings bond, to be given to the contestant having the winning entry in each of the five Divisions. The national award will consist of a $250 U. S savings bond, and will go to one of the five divisional winning contestants. Deadline for state entries is midnight of May 1, 1954.

For further information about this contest, write to *American Legion Auxiliary, 49 West 44th St., New York 36, N. Y.*

♦ The Small Homes Council of the University of Illinois has just issued a new circular on basements.

The 8-page bulletin gives pointers for constructing basements so they are well built, light, dry, and useful. In addition, suggestions are given for correcting some of the more common difficulties found in basements.

The circular presents a table of recommendations for basement construction under various conditions. It describes necessary wall and floor construction, waterproofing, and drainage connections. It also explains how to repair basement leaks, and what to do about faulty drainage.

Single copies of "Basements" are free from the Small Homes Council, Mumford House, University of Illinois, Urbana, until February 1, after which they will be 10 cents, the same as 24 other circulars on home building and improvement issued by the council. The whole set is $2.50, with the buyer's name placed on a list to receive free all future publications in the series.

"Basements" is based on material by R. A. Jones, W. H. Kapple, and J. T. Lendrum, edited by M. H. Kennedy, and illustrated by J. J. Sorbie.

♦ Two talented Michigan high school students have been declared winners of the first annual Atlas Press Company scholarship awards in industrial arts at Western Michigan College.

They will receive $500 scholarships good for their four years at Western Michigan while studying industrial arts. From a large field of applicants 12 were selected to come to Kalamazoo with their instuctors where they met with board of examiners. Out of this group two were chosen for the honor.

From Negaunee, high in the Upper Peninsula, comes Jack Johnson, and the second winner came from near the Indiana border, being William Hopkins of Sturgis. Both will enter Western Michigan in the fall.

Their respective instructors, Matt Vanni and John W. Borgerding, have been asked by the Atlas Press Company to select an Atlas power tool for their school shops.

In addition, 18-in. jig saws are being shipped to each of the ten other contestants.

(Continued on next page)

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NEWS NOTES

(Continued from previous page)

♦ Awards offered in the 1954 Fisher Body Craftsman's Guild model car competition have been increased from $65,000 to $90,000. This includes cash awards for the best model cars in each state and the District of Columbia and university scholarships worth $20,000, for national winners. In addition to the individual awards, the Guild this year will award permanent trophies to the schools attended by regional and national winners.

Any boy in the United States between the ages of 12 through 19 is eligible to enter the competition and may obtain an enrollment card by writing to the Fisher Body Craftsman's Guild, General Motors Building, Detroit 2, Mich.

A booklet on model car design and construction, the only textbook of its kind for youths wishing to learn about automobile design, is given to each boy enrolling in the Guild.

PSYCHOLOGICAL WARFARE PRESSES

Four additional mobile printing plants, which include the revolutionary new American Type Founders press capable of printing a million leaflets in twenty-four hours, are being delivered to the Department of Defense by American Type Founders. First of the new printing units is already in use. When it was delivered last fall, Frank Pace, Jr., then Secretary of the Army, characterized it as "the latest development in psychological warfare."

These completely self-contained, self-sustaining printing plants can be flown direct to any point, hauled by truck tractors to follow a fluid front, and put into immediate use. They consist of two ten-ton trailer vans. One contains complete editorial and copy preparation equipment. The other, a printing trailer, houses the specially designed ATF web-fed offset press. Both are equipped with automatic thermostatic controls for heat and humidity so that operations can be carried on efficiently at temperatures as low as 40 deg. below zero and as high as 120 deg. Fahrenheit.

In the editorial trailer, the propaganda officer in charge directs writing of copy and setting of type. He is assisted by three script writers, two artists, and two Vari-typer operators. Through a coding device, it is possible for writers who do not speak a foreign language to turn out copy in any one of a dozen languages.

Besides the ATF press, the printing trailer houses an overhead camera, darkroom, vacuum printing frame, and all the other equipment needed for making offset plates. When the platemaker finishes the plates, he merely turns around and hands them to the pressman, who straps them to the impression cylinders and starts the press.

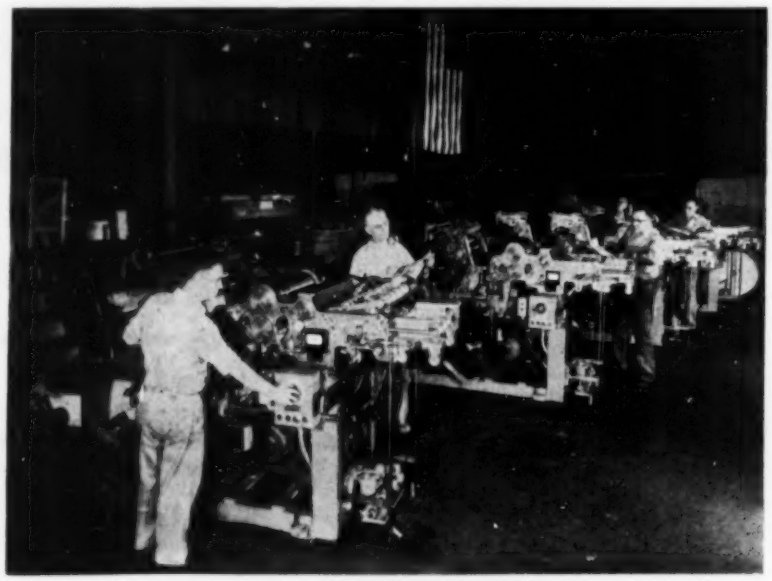
The press will print three or more propaganda leaflets on both sides of the sheet with every cylinder revolution. Theoretical top speed of cylinder revolutions has not yet been attained, but the press has already been operated in excess of 35,000 cylinder revolutions per hour.

The propaganda leaflets used in psychological warfare by UN forces in Korea are single, unfolded sheets printed on one or both sides. They may either be dropped in dispersal bombs from high altitudes over enemy lines or fired from 105mm. howitzers at the enemy at close range.

The press itself is fed from 16-in. rolls of paper. Cylinder circumference is 10½ in. At each cylinder revolution, the web of paper is cut to size, perforated both vertically and horizontally at the same time, and delivered in flat sheets which are then merely broken apart in lifts to eliminate the time-consuming operation of cutting after the material has been printed. Each roll of paper is 32 in. in diameter, weighs 350 lbs., and contains approximately 24,000 10½-in. sheets. As one roll of paper is used up, another is brought to the roll stand by a self-contained electric hoist.

Floor space required for the press is less than 35 sq. ft. It weighs only 5000 lbs.

♦ The Greer Technical Institute, 2230 South Michigan Ave., Chicago, Ill., which has specialized for over 50 years in trade training, now offers a new two-year technology program for high school graduates in diesel and automotive engineering.



Psychological Warfare presses, designed by American Type Founders for the U. S. Armed Forces, being tested in ATF's Mount Vernon, N. Y. plant. These presses are capable of printing over 1,000,000 impressions a day

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SHOP EQUIPMENT NEWS

NEW MILLERS FALLS RIGHT-ANGLE DRIVE FOR ¼-IN. ELECTRIC DRILLS

The new Millers Falls Right-Angle Drive multiplies the usefulness of ¼-in. electric drills. With this new attachment it is easy to work in corners, between studs, and in many spots which would normally be impossible to reach. It can be used for drilling, for operating sanding disks, for polishing, wire brushing, grinding, etc.

The No. 2130 fits all ¼-in. drills with spindles ½ in. long or longer and with ⅜-in.—24 internal or external threading.

New Millers Falls No. 2130 Right-Angle Drive

The gears run in a sealed grease chamber and are precision-cut from solid steel blanks. Spindles run in long "Oilite" self-lubricating bronze bearings. The reversible hardwood handle is mahogany finished. The drive body is finished in hammertone gray enamel.

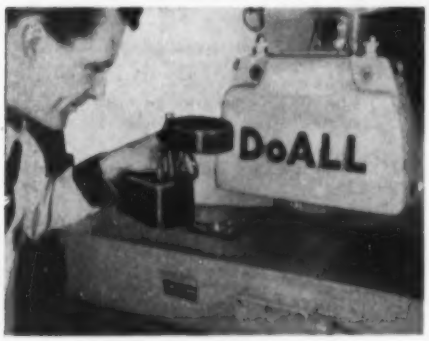
For further information write to *Millers Falls Co., Greenfield, Mass.*

(For Convenience Circle Index Code 0301)

MINUTE "MONOLIGHT" FOR ON-THE-JOB INSPECTION

The DoAll Company has placed on the market a *featherweight* 2-in. monochromatic light generator for inspection of flatness, finish, and size with optical flats. This very small "Utility Monolight" rounds out the company's line of 5- and 20-in. units.

Because of its size (base is 7 in. long by 3½ in. wide), the new Monolight is ideal for use at production machines, production inspection stations, or for use by roving inspectors. It permits on-the-job checks, for example, right on the chuck of a surface grinder or on the surface of laps. Adequate magnetic shielding of lightweight aluminum permits inspection to be made on magnetic chucks when chuck power is on.



On-the-job inspection with the Minute Monolight

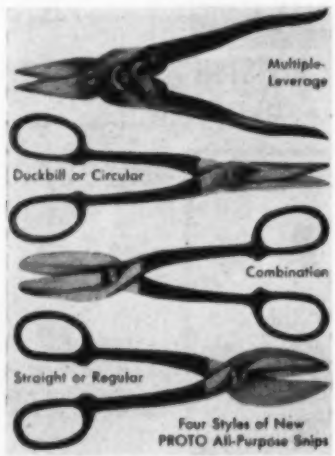
Not equipped with a stage, it is designed for use directly on the work surface of a machine tool or on a surface plate. In use, the head is rotated to the rear so that it is directly over the work surface. Work is placed under the head in back of the instrument. Head is rotatable a full 360 deg. around the column. It may also be removed from the instrument for use as a handheld light source. Light generating element in this new Monolight is helium. The unit operates on the standard 110-volt, 60-cycle line.

For additional information call your nearest DoAll Sales-Service Store or write *The DoAll Company, Des Plaines, Ill.*

(For Convenience Circle Index Code 0302)

PROTO ALL-PURPOSE SNIPS

Eleven all-purpose snips have been added to the Proto line. Included are three multiple-leverage snips — left, right, and straight cut; three duckbill or circular snips — 7-, 10-, and 12-in.; two combination pattern snips — 10- and 12-in., and three straight or regular snips — 7-, 10-, and 12-in.



Four styles of New Proto All-Purpose Snips

All of these snips cut metals, rubber, leather, linoleum, canvas, and hundreds of other materials. Their blades are hot drop forged from special steel. Electrically controlled heat treating gives the two blades in each snip the same essential hardness.

For further information write to *Plomb Tool Co., Los Angeles, Calif.*

(For Convenience Circle Index Code 0303)

NEW BLACK & DECKER UTILITY SAWS

The Black & Decker Utility 7-, 8-, and 9-in. Heavy-Duty saws for 1954 have been completely redesigned to facilitate operation and speed accurate sawing for the building construction fields.

Among the features of B&D's new Heavy-Duty Saws are: an exclusive saw grip handle, placed at natural sawing position; a king-size lever arm for retracting the lower blade guard for making pocket cuts; heavy-duty Universal motors designed specifically for power sawing; and improved cutting line and blade visibility.

Other features include a large, sturdy shoe for good support and easy right- or left-handed operation; full adjustment for depth or angle of cut; instant release trigger switch and telescoping lower blade guard for safe operation, and an auxiliary knob on the front of the saw for two-handed operation when desired. The power cable on the new saws passes out the end of the handle to eliminate interference with the operator or work material.

New Black & Decker 8-in. Saw

A new 6-in. Heavy-Duty Adjustable Saw rounds out the 1954 Black & Decker Utility Saw Line. This saw is designed for trim work and for home craftsmen and do-it-yourself enthusiasts.

For further information write to Thomas S. Hook, *The Black & Decker Mfg. Co., Towson 4, Md.*

(For Convenience Circle Index Code 0304)

SINGLE HEX COMBINATION WRENCHES

Snap-on Tools Corporation announces a new series of four combination open end Boxocket wrenches with single hexagon openings on the Boxocket end. These single hex openings provide extra gripping power for slightly undersized or chewed-up nuts and on Parker-Kalon self-tapping screws with rounded corners. They will also prevent damaging brass or other soft metal fasteners and fittings due to the greater contact area provided by the six sided shape.

Made in 5/16-, 3/8-, 7/16-, and ½-in. sizes, both the open end and Boxocket openings are the same size on each wrench. Over-all lengths are 5 to 5¾ in. for work in restricted areas. Wrenches are finished in polished chrome. For further in-

(Continued on page 94A)

Single Hex Combination Wrench

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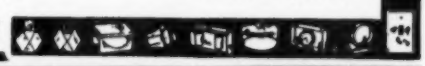

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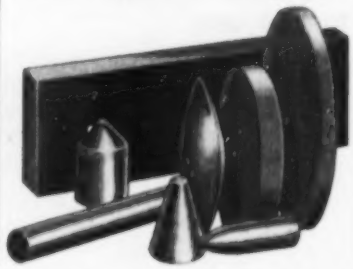

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SHOP EQUIPMENT NEWS

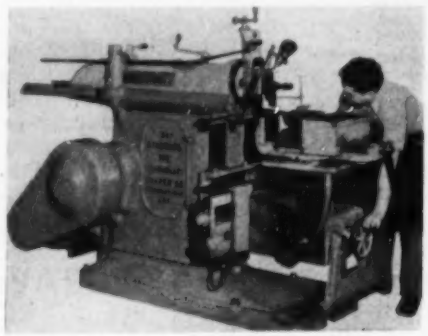
(Continued from page 92A)

formation, write to *Snap-on Tools Corporation, Kenosha, Wis.*

(For Convenience Circle Index Code 0305)

NEW 24-IN. STANDARD CINCINNATI SHAPER

The Cincinnati Shaper Company announces their new 24-in. Standard Cincinnati Shaper, equipped with a special tilting table, that positions work so quickly and accurately that setup time is held to a minimum.



New 24-in. Standard Cincinnati Shaper

The table tilts about a pivot and is driven by a handcrank arrangement, convenient to the operator's position. A quick clamping scheme is also provided to maintain accurate setups.

For further information write to *The Cincinnati Shaper Co., Hopple, Gerrard and Elam Sts., Cincinnati 25, Ohio.*

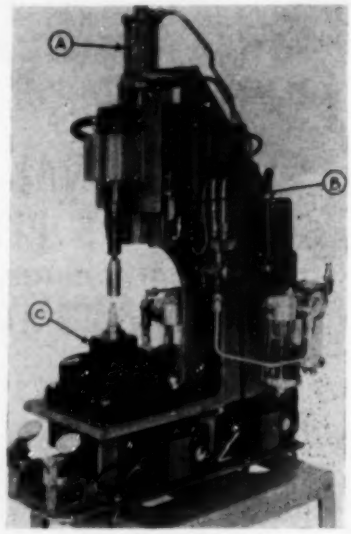
(For Convenience Circle Index Code 0306)

AIR UNITS SPEED SPARK PLUG ASSEMBLING

A combination of electrical and pneumatic devices drives home the locking nut on Duchess spark plugs, with a minimum of time and effort.

Following is the sequence of the machine:

1. Spark plug is placed in collet fixture (C).
2. Main air valve is opened to supply collet pressure.
3. Micro-switch on left is depressed, shifting 4-way double solenoid valve. Double acting cylinder (A) moves dovetail slide, carrying nut setter toward plug.
4. Prior to setter socket engagement over hex nut of plug, cam finger (B) attached to dovetail slide trips micro-switch roller energizing two-way solenoid supplying air to nut setter. Tripping of this micro-switch also starts timer motor.
5. Socket controlled by a built-in clutch. Timer is adjusted to allow air to setter only sufficient to throw clutch. Solenoid controlling setter air is then reversed by timer, freeing contact pressure between socket and nut prior to upward travel of socket.
6. Depression of micro-switch on right, shifts 4-way double solenoid valve. Double acting cylinder moves dovetail slide upward to original position. Upward travel of slide removes cam finger attached to slide from micro-switch de-energizing timer motor allowing for reset for next operation. 4-B bench valve is shifted releasing collet fixture. Complete time cycle 3 seconds.



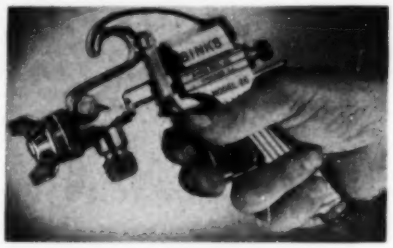
Electric-Pneumatic Spark Plug Assembler

For further information send for free Air Power Catalog to *Mead Specialties Co., 4114 North Knox Ave., Dept. LS-22, Chicago 41, Ill.*

(For Convenience Circle Index Code 0307)

BINKS MANUFACTURING COMPANY DEVELOPS NEW SPRAY GUN

A new lightweight, *inexpensive* spray gun has been developed by the Binks Manufacturing Company of Chicago.



Binks new Model 26 Paint Spray Gun

The new spray gun, Model 26, weighs only 15 ounces. The body is aluminum. Its handle and trigger are designed to fit even a small hand. The light weight and easy fit of this gun assures that operators can use the gun for long periods

The gun has a replaceable cartridge-type air valve. It also features a brass fluid passage which protects the body from the corrosion and erosion caused by many paints and other fluids.

A new Bulletin 26 describing this gun will be sent to all who request it. Address the *Binks Mfg. Co., 3122 Carroll Ave., Chicago 12, Ill.*

(For Convenience Circle Index Code 0308)

THE NEW COLUMBIAN GYRO-VISE

A new all-purpose vise — said to work equally well in any upright or "on-its-side" position — is announced by The Columbian Vise & Mfg. Co., Cleveland.

Known as Columbian Gyro-Vise No. 72½, the new vise operates from, and rotates around, a standard base which can be mounted in any desired location. Additional bases can be placed

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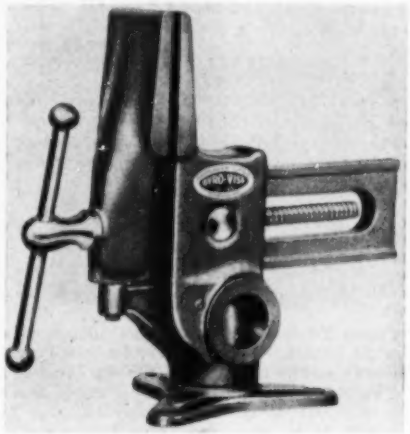
in different parts of the home, garage, or shop and the vise easily moved from job to job.

Regardless of its position, upright or flat, the vise moves in a full circle. It locks automatically in any selected position.

Gyro-Vise jaws are 2½ wide and 4¼ in. deep. Maximum jaw opening is 5 in. The manufacturer claims that these jaws will also hold paper-thin objects securely and without marring. Overall height is 10½ in. and weight is 16 lb.

Columbian Gyro-Vises are reputed to be suitable for all types of home workshop and commercial applications. They are said to be particularly well adapted to drill press work, carving, carpentry, sanding, coping saw work, and tool sharpening.



Columbian Gyro-Vise No. 72½

For further information write to: *The Columbian Vise & Mfg. Co., Cleveland 4, Ohio.*

(For Convenience Circle Index Code 0309)

NEW BRUNSWICK TABLET ARM CHAIR

With the simple attachment of a tablet arm, Brunswick's classroom chair becomes a tablet arm chair. This simple addition of a detachable tablet arm demonstrates the Brunswick 4-in-1 feature which enables the basic classroom chair also to serve as a tablet arm chair, a guest chair, or a chair desk.

(Continued on next page)

New Brunswick Tablet Arm Chair

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SU-90

SHOP EQUIPMENT NEWS

(Continued from previous page)

The write-angle top of the table arm, with a five-degree slope, also provides added writing comfort by placing the writing paper at a normal writing position. This tablet arm is available in either right- or left-hand units, and it supplies almost 300 sq. in. of working space.

Brunswick offers this tablet arm in a choice of durable 5/8-in. thick plywood with or without a plastic facing or in a 3/4-in. thick solid wood top.

A book rack also is available.

Brunswick's tablet arm chairs are offered in seat heights of 16, 17, and 18 in.

For further information write to *The Brunswick-Balke-Collender Co., 623 S. Wabash, Chicago, Ill.*

(For Convenience Circle Index Code 0310)

TOP-LOADING ELECTRIC CERAMIC FURNACE

Pereny Equipment Company has announced a new pit furnace, Model PT-2550. The new Pereco furnace provides close control to 2500° F.

This top-loading furnace offers a firing chamber of 18,900 cu. in. The chamber measures 18 in. wide, 25 in. deep, and 42 in. high. Over-all dimensions, width, 48 in.; depth, 53 in.; and height, 82 in.

Model PT-2550 Electric Ceramic Pit Furnace

The lid over the firing chamber is ball-bearing mounted, side-sliding, and counterbalanced for easy action, to permit loading from a hoist or conveyer.

Fully insulated with 9-in. insulation of high thermal characteristics. The furnace may be equipped with any standard make temperature control required. Facilities for panel mounting are provided. Voltage regulating 36-tap magnetic contactor power controls are supplied, and the PT-2550 is available with or without atmospheric controls for oxidation conditions.

For further information write to *Pereny Equipment Co., 893 Chambers Road, Columbus, Ohio.*

(For Convenience Circle Index Code 0311)

(Continued on next page)

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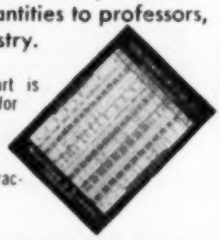
"Drill and Reamer Facts" describes and illustrates the design and construction of various drill types, drill pointing, proper care and use of drills, recommended speeds and feeds, etc. Reamer section contains a short treatise on design, construction, use and care, cause of breakage, etc.

Here are two pieces of literature that will be of invaluable assistance to instructors, students, apprentices and experienced mechanics. They are available in limited quantities to professors, teachers and industry.



Decimal equivalents chart is available in three sizes for pocket, desk and wall use. It contains decimal equivalents and tap drill sizes of wire gauge, letter and fractional size drills.

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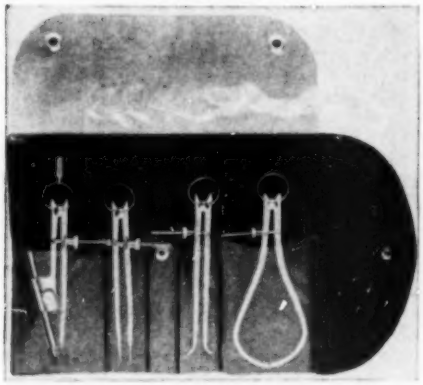

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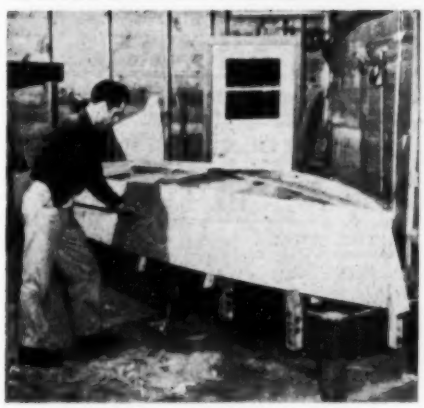

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For further information write to *George H. Bowman, Jr., Salem, Ohio.*

(For Convenience Circle Index Code 0312)

AMERICAN TYPE FOUNDERS MOBILE PRINTING PLANTS

Four additional mobile printing plants, which include the revolutionary new ATF press capable of printing a million leaflets in 24 hours, are being delivered to the Department of Defense by American Type Founders.

These completely self-contained, self-sustaining printing plants can be flown direct to any point, hauled by truck tractors to follow a fluid front and put into immediate use. They consist of two ten-ton trailer vans. One contains complete editorial and copy preparation equipment.

The other, a printing trailer, houses the specially designed ATF web-fed offset press. Both are equipped with automatic thermostatic controls for heat and humidity so that operations can be carried on efficiently at temperatures as low as 40 deg. below zero and as high as 120 deg. F.

Floor space required for the ATF press which is part of these units, is less than 35 square feet. It weighs only 5000 pounds.

American Type Founders, Elizabeth, N. J.

(For Convenience Circle Index Code 0313)

CARBIDE DIE DRILLS

A Whitman & Barnes Carbide Die Drill was recently put to an unusual test by the Victor Equipment Co., San Francisco, Calif.

While tapping a Stainless Steel Regulator Body, with a high speed precision ground tap, the tap became lodged in the part and could not be removed by any means at their disposal. The flutes were clogged with chips.

Fortunately, it was a through hole and it was suggested that a Whitman & Barnes Die Drill, ⅜-in. in diameter be used. The tap was successfully drilled to a depth of ½ in. The flutes were then easily broken off and the tap removed.

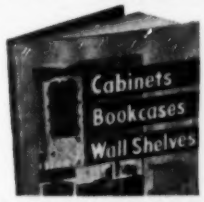
The drill was operated dry and an excessive surface feet per minute was used, so that the drill became nearly white hot, yet the braze did not fail.

A circular describing and illustrating die drills,

(Continued on next page)

SHOP BOOKS

CABINETS, BOOKCASES and WALL SHELVES



Plans and instructions for building 27 varieties of cabinets for improving the appearance of the home of today. In addition, 19 styles of bookcases and 31 useful and decorative wall shelves. Over 630 photographs, drawings and sketches reveal every construction detail. Step-by-step instructions for 17 up-to-date home projects.

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Measured drawings and complete construction details of 38 masterpieces. Chests, tables, chairs, desks, etc.

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Practical time-and-labor savers. 171 shop accessories developed by trade experts for their own use. How to make special benchwork tools used in the trade.

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Smart-looking modern furniture by a professional designer. Construction simplified for beginners. Harmonizing pieces for every room. Complete plans, photos and details.

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This book supplies all the help you need for building up-to-date kitchen cabinets. It explains how to build a single unit or any combination of units. There are floor and wall models to fit every layout. Complete drawings, instructions and lumber cutting lists are included. Tells how to plan the remodeling work, how to build and install the cabinets.

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Most complete book of useful lathe projects. Over 70 things you can make — and will want to add to your home. Popular woodenware for the table; bowls, trays, servers, elegant stands and tables, bed, chair, floor lamps and table lamps, decorative boxes, many others. Include 30 classical and period turning profiles you can copy. Also explains hundreds of special methods and tricks of the trade. Lathe finishing.

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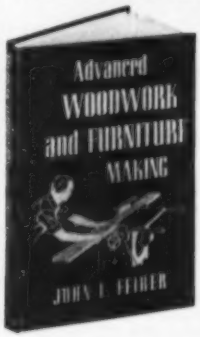

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SHOP EQUIPMENT NEWS

(Continued from previous page)

which are able to drill hardened steel, can be obtained from *Whitman & Barnes, Plymouth, Mich.*

(For Convenience Circle Index Code 0314)

KODASCOPE PAGEANT SOUND PROJECTORS RECEIVED HARD TEST RUNS

Recently, at the Colorado Educators Association convention, two of the standard Kodascope Pageant Sound Projectors were given a real test.

These projectors feature lubrication for life, which is said to remove the greatest cause of projector breakdowns, plus such other refinements as nylon gears and sealed-in-oil bearings for long term quiet operation.

Both of these projectors were run continuously for over 1000 hours each.

A firm of certified public accountants were hired to check their continued operation from day to day.

A month and a half later of steady day and night operation—after the machines had run for the equivalent of at leat 2½ years of normal school use—the accountants snapped them off again. At the time they were still running as smoothly and quietly as when they had been started. No service, lubrication, or other attention had been necessary. Each machine had run for a total of 1122 hours without stopping.

Eastman Kodak Co., Rochester 4, N. Y.

(For Convenience Circle Index Code 0315)

NEW LOG-LOG SLIDE RULE

The Post Company of Wisconsin Inc. is marketing a new log log slide rule, the Versalog, which is capable of simplifying and solving most engineering calculations.

While adhering to the fundamental principles of the usual slide rule, it presents many improvements and refinements in the form of better scale arrangements, new color coding, and convenient end zone designations.

Combining the natural properties of the bamboo reed with the reinforcing qualities of laminating has produced a slide rule protected against most atmospheric conditions, thus making the Versalog permanently accurate and smoothly operating.

Furnished with the Versalog is a self-instruction manual which will make the use of this fine engineering slide rule with its greater accuracy, new color coding, and new end zone designations, simple and understandable to students of civil, electrical, and mechanical engineering.

Frederick Post Co. of Wisconsin, Inc., 115 East Wells St., Milwaukee 2, Wis.

(For Convenience Circle Index Code 0316)

NEW PAINT-ON SOLDER-PASTE-FLUX COMBINATION

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For further information about this unique flux, write to *Eutectic Welding Alloys Corp., 172 St. and Northern Blvd., Flushing 58, N. Y.*

(For Convenience Circle Index Code 0317)

A thousand men worked two million man-hours laying the 578 miles of pipe line that comprise the new West Texas Gulf system. — *Petroleum Newsnotes.*

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DIRECTORY OF MANUFACTURERS' PRODUCTS

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 109A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 110A.

A

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Plumb, Inc., Fayette R.

B

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Business and Personal News

BLACK & DECKER PLANT ADDITION ERECTED

The $2,000,000 addition to the Hampstead, Md., branch plant of The Black & Decker Manufacturing Company for which ground was broken last spring has been erected and is now beginning operation. This new addition, covering 126,800 sq. ft., is more than double the size of the original Hampstead branch plant.

This new addition will provide needed space for branch plant departments which needed room, due to the increased production. Punch press, sheet metal, forging, field and stator winding, and large tool assembly departments will now be able to expand. The new plant addition is almost identical in construction with the original plant, but larger in area by 16,800 sq. ft.

Present plans do not include moving any major department from the Towson plant of the firm to Hampstead.

In addition to its two Maryland plants, Black & Decker has a large plant making the same products at Harmondsworth, England, and has wholly owned subsidiaries in Canada, Australia, Mexico, and Brazil. The company operates 37 Factory Sales and Service Branches in the U. S. and Canada.

FRANK M. JACOBS APPOINTED DISTRICT SALES MANAGER

A. B. Dick Company, announce the appointment of Frank M. Jacobs as a district sales manager on January 4.

Mr. Jacobs will assume his new duties immediately in a district covering Eastern Pennsylvania and Central New Jersey.

D. P. GRAHAM APPOINTED ADVERTISING AND SALES PROMOTION MANAGER

Durward (Dewey) P. Graham has been appointed advertising and sales promotion manager of the Harper Electric Furnace Corporation, manufacturers of high temperature electric furnaces and kilns, used throughout ceramic, powdered metal, and general metalworking fields.

Mr. Graham has a background of long experience in all phases of industrial and technical advertising.

PERSONNEL CHANGES IN DeWALT INC., SUBSIDIARY OF AMERICAN MACHINE & FOUNDRY COMPANY

W. Ross Stevens who had been with DeWalt Inc., Lancaster, Pa., for more than 27 years, has retired as advertising manager. He will continue his association with the firm as a special consultant on sales and advertising matters.

John Stolarz, formerly industrial sales manager, will direct the advertising and sales promotion departments.

Lester R. Mellott who has been with the company three years has been named assistant sales promotion manager.

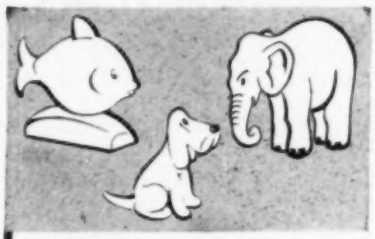
Arthur J. McMurray, formerly "power shop" sales manager in charge of the distribution of the company's line of home-shop equipment, has been named assistant general sales manager.

All changes became effective January 1, 1954.

DAN C. SWANDER, JR., ELECTED VICE-PRESIDENT

Dan C. Swander, Jr., has been elected executive vice-president of The Columbian Vise & Mfg. Co., Cleveland, Ohio.

(Continued on page 102A)



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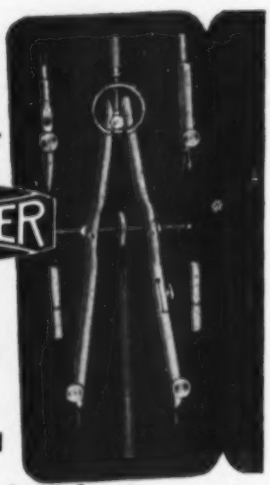

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Handcrafters, The
Millers Falls Co.
Walker-Turner Co., Inc.

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Chicago Latrobe Twist Drill Works
Greenlee Tool Co.
Millers Falls Co.
North Bros. Mfg. Co.
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Post Company, Frederick
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Duro Metal Products Co.
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Yates-American Machine Co.

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Delta Mfg. Co.
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Duro Metal Products Co.
Heston & Anderson
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Shopmaster, Inc.
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Dietzgen Co., Eugene
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Engineering Mfg. Co.
Hamilton Mfg. Co.
Industrial Bench & Equip. Co.
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Post Company, Frederick
Stacor Equipment Co.
Tolerton Co.
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Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
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Dietzgen Co., Eugene
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Post Co., Frederick
Weber Co., F.

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Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Keuffel & Esser
Post Company, Frederick
U. S. Blue Print Paper Co.
Weber Company, F.

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Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
U. S. Blue Print Paper Co.
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Brodhead-Garrett Co.
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Shopmaster, Inc.
South Bend Lathe Works

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Millers Falls Co.
Skil Corporation
Snap-On Tools, Inc.
Stanley Electric Tools

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Cincinnati Lathe & Tool Co.
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Brodhead-Garrett Co.
Duro Metal Products Co.
Mall Tool Co.
Millers Falls Co.
Snap-On Tools, Inc.
South Bend Lathe Works
Stanley Electric Tools
Whitman & Barnes

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Millers Falls Co.
North Bros. Mfg. Co.
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Elbar Products
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DUST COLLECTORS
American Air Filter Co.

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E

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Whelan Company, L. E.

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Standard Electric Time Co.

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F

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Sunbeam Corp.

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Brodhead-Garrett Co.
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G

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General Electric Co.
Weston Electric Instrument Co.

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Millers Falls Co.
Stanley Tools

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GAUGES, CALIPER
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Stanley Electric Tools
U. S. Machine Tool
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Brodhead-Garrett Co.
Delta Mfg. Co.
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Duro Metal Products Co.
Lima Electric Motor Co.
Mall Tool Co.
Millers Falls Co.
Mummert-Dixon Co.
Skil Corporation
Snap-On Tools, Inc.
Stanley Electric Tools
U. S. Machine Tool
Walker-Turner Div.

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Brodhead-Garrett Co.
Mummert-Dixon Co.
Oliver Machinery Co.

GRINDERS, PEDESTAL TYPE
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Brodhead-Garrett Co.
Delta Mfg. Co.
Lima Electric Motor Co.
Mall Tool Co.
Mummert-Dixon Co.
South Bend Lathe Works
Stanley Electric Tools
U. S. Machine Tool
Walker-Turner Co., Inc.

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Brown & Sharpe Mfg. Co.
Dumore Co., The

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Black & Decker Mfg. Co.
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Cincinnati Milling Machine Co.
Dumore Co., The
Lima Electric Motor Co.
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Skil Corporation
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Brodhead-Garrett Co.
Cincinnati Milling Machine Co.
DeWalt Products Corp.
Dumore Co., The
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No. 450 Plurality Jr.
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HANOVER, PENNSYLVANIA
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

BUSINESS & PERSONAL NEWS

(Continued from page 100A)

Mr. Swander has been affiliated with Columbian Vise since 1935 when he was graduated from Dartmouth's Tuck School of Business Administration. His experience includes service as district sales representative, assistant sales manager, and company secretary. He was made vice-president in charge of sales in 1947 and will combine the duties of that position with his new over-all company responsibilities.

He also is chairman of the marketing methods committee of The American Supply & Machinery Manufacturers Association.

E. H. GRIFFITHS NAMED SALESMAN

Edward H. Griffiths has been assigned as salesman in the New York City sales branch of Libbey Glass.

A native of Boston, Mass., Mr. Griffiths attended grade and high schools in that area and was graduated from Norwich University, Northfield, Vt.

THOMAS M. GERAGHTY NAMED SALES MANAGER

DeWalt, Inc., has named Thomas M. Geraghty as district sales manager for a territory comprised of the state of West Virginia, 13 counties in eastern Kentucky, and that portion of Pennsylvania to the west of Lewistown.

Mr. Geraghty is a native of Carteret, N. J. He attended the Middlesex Junior College in Perth Amboy and Rutgers University. From 1938 until 1942 he was a sales representative for Wilson & Company, wholesale meats and by-products distributors.

In his new position, he will make his residence in Pittsburgh, the largest residential and industrial center in his territory.

Descriptive Material

NEW GREENLEE TOOL CATALOG

A new 20-page catalog of tools for mortising, boring, and routing, No. 34-M, has just been announced by Greenlee Tool Company.

The catalog illustrates and describes in detail a complete line of hollow chisels and bits, machine bits and drills, router bits, dowel bits, plug cutters, and countersink bits and drills. It also includes sharpening instructions and a boring chart for wood screws.

For your copy of this catalog write to *Greenlee Tool Co., Rockford, Ill.*

(For Convenience Circle Index Code 0318)

(Continued on page 104A)

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Stanley Tools
Williams Co., J. H.

HAMMERS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Mall Tool Co.
Millers Falls Co.
Stanley Electric Tools

HAND SAWS
Brodhead-Garrett Co.

HAND SAWS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Millers Falls Co.
Stanley Electric Tools

HAND SCREWS
Adjustable Clamp Co.
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Blake Company, F. I.
Brodhead-Garrett Co.
Craftools, Inc.
Craftsman Supply House
Craftsman Wood Service Co.
Deks, Inc.
Eastern Handicraft Supply Co.
Gearon Company, The
General Finishes Sales & Service Co.
Hammett Co., J. L.
Handcrafters, The
Hubbell Metals, Inc.
LeisureCrafts
Metal Goods Corp.
Schweizer Aircraft Corp.
X-Acto Crescent Products Co., Inc.

HARDIES
Brodhead-Garrett Co.
Stanley Tools

HATCHETS
Plumb, Inc., Fayette R.

HEAT-FLOW METERS
Brodhead-Garrett Co.
Weston Electric Instrument Corp.

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Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Whelan Company, L. E.

HEAT-TREATING EQUIPMENT
American Gas Furnace Co.
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Johnson Gas Appliance Co.
Sunbeam Corp.

IMPACT TOOL, Portable Electric
Millers Falls Co.

I

IMPORTERS GERMAN DRAWING INSTRUMENTS
Gramercy Import Co., Inc.

INDICATING INSTRUMENTS, ELECTRIC
General Electric Co.
Weston Electric Instrument Co.

INDUSTRIAL ARTS AWARDS
Ford Motor Co.

INDUSTRIAL WIPING MATERIAL
Safeguard Co., Inc.

INK REMOVERS
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Weber Company, F.

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Dietzgen Co., Eugene
Eastern Handicraft Supply Co.
Elliott Co., B. K.
Higgins Ink Co., Inc.
Hunt Pen Co., C. Howard
Keuffel & Esser
LeisureCrafts
Post Company, Frederick
U. S. Blue Print Paper Co.
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INKS, PRINTING
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Brodhead-Garrett Co.
Driscoll & Co., Martin
Hunt Pen Co., C. Howard

INTERCOMMUNICATION SETS
Telephone Engineering Co.

J

JEWELERS' TOOLS, EQUIPMENT AND SUPPLIES
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Craftools, Inc.

JIG SAWS
Atlas Press Co.
Boice Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
De Walt Products Co
Duro Metal Products Co.
Oliver Machinery Co.
Shopmaster, Inc.
Walker-Turner Co., Inc.
X-acto Crescent Products
Yates-American Machine Co.

JOINTERS
Atlas Press Co.
Boice Crane Company Co., Inc.
Brodhead-Garrett Co.
Delta Mfg. Co.
De Walt Products Co.
Duro Metal Products Co.
Heston & Anderson
Oliver Machinery Co.
Shopmaster, Inc.
Walker-Turner Co., Inc.
Yates-American Machine Co.

JOINTERS, BENCH
Atlas Press Co.
Boice Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Heston & Anderson
Oliver Machinery Co.
Shopmaster, Inc.
Walker-Turner Co., Inc.
Yates-American Machine Co.

JOINTERS, HAND
Brodhead-Garrett Co.
Delta Mfg. Co.
Millers Falls Co.
Yates-American Machine Co.

K

KEENE CEMENT
Brodhead-Garrett Co.
Eastern Handicraft Supply Co.

KILNS
Brodhead-Garrett Co.
Craftools, Inc.
Eastern Handicraft Supply Co.
Electric Hotpack Company, Inc.
LeisureCrafts

KNIVES, BAND
KNIVES, MACHINE
Brodhead-Garrett Co.
Oliver Machinery Co.
Simonds Saw & Steel Co.
Yates-American Machine Co.

KNIVES, HOBBY
Brodhead-Garrett Co.
Eastern Handicraft Supply Co.
Elliott Co., B. K.
Handcrafters, The
LeisureCrafts

KNIVES, PAPER CUTTER
American Type Founders Sales Corp.
Brodhead-Garrett Co.
Eastern Handicraft Supply Co.
Millers Falls Co.
Simonds Saw & Steel Co.

KNIVES, SLOYD
Brodhead-Garrett Co.
Eastern Handicraft Supply Co.

KNOCK-DOWN BOATS
Dillabaugh Co., C. R.

KNOCK-DOWN FURNITURE
Brodhead-Garrett Co.
Giles & Kendall

KNURLS
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Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Williams & Co., J. H.

L

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General Electric Co.
Weston Electric Instrument Co.

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Kassel & Co., L. H.

LAMPS, MINIATURE
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General Electric Co.

LATHE ATTACHMENTS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
Cincinnati Lathe & Tool Co.
DeWalt Products Corp.
Dumore Company, The
Duro Metal Products Corp.
Lima Electric Motor Co.
Pootatuck Corp.
Sheldon Machine Co., Inc.
South Bend Lathe Works
Walker-Turner Div.
Williams Co., J. H.

LATHES, Bench, Metal Working
Atlas Press Co.
Boice Crane Company
Brodhead-Garrett Co.
Cincinnati Lathe & Tool Co.
Duro Metal Products Co.
LeBlond Machine Tool Co., R. K.
Logan Engineering Co.
Pootatuck Corp.
Rockford Machine Tool Co.
Sheldon Machine Co., Inc.
South Bend Lathe Works

LATHES, GAP BED
Boice Crane Company
Brodhead-Garrett Co.
Cincinnati Lathe & Tool Co.
Duro Metal Products Corp.
LeBlond Machine Tool Co. Inc.
Walker-Turner Co., Inc.

LATHES, SMALL PRECISION
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Brodhead-Garrett Co.
DeWalt Products Corp.
South Bend Lathe Works
Sheldon Machine Co., Inc.

LATHES, SPINNING
Atlas Press Co.
Brodhead-Garrett Co.
Boice Crane Company
Delta Mfg. Co.
Haag Machine Co., Inc.
Oliver Machinery Co.
Sheldon Machine Co., Inc.
Walker-Turner Co., Inc.

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LEADS, DRAFTING
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Eastern Handicraft Supply Co.
Larson Co., J. C.
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Sax Brothers Co.

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Eastern Handicraft Supply Co.
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LeisureCrafts
Osborn Bros.
Sax Brothers Co.
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Cunningham Co., M. E.
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Elliott Co., B. K.
Lufkin Rule Co.
Millers Falls Co.
South Bend Lathe Works
Stanley Tools
Starrett Co., L. S.

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Brodhead-Garrett Co.
LeisureCrafts
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Eastern Handicraft Supply Co.
Elliott Co., B. K.
Hunt Pen Co., C. Howard
LeisureCrafts
Weber Co., F.
X-acto Crescent Products Co., Inc.

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Brodhead-Garrett Co.

LOOMS
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Eastern Handicraft Supply Co.
Hammett Co., J. L.
Handcrafters, The
LeisureCrafts

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Cotton-Hanlon, Inc.
Craftsman Wood Service Co.
Foley Lumber Co., T. A.
Giles & Kendall
Hardwood Corp. of America
Paxton Lumber Co., Frank

LUMBER — HARDWOODS
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Cotton-Hanlon, Inc.
Hardwood Corp. of America
Paxton Lumber Co., Frank

M

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Brodhead-Garrett Co.
DeWalt Products Corp.
Heston & Anderson
Oliver Machinery Co.
Yates-American Machine Co.

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Boice Crane Co.
Brodhead-Garrett Co.
South Bend Lathe Works
Walker-Turner Div.

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Williams Co., J. H.

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Brown & Sharpe Mfg. Co.
Do All Co.
Lufkin Rule Co.
Millers Falls Co.
Stanley Tools
Starrett Co., L. S.

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Brodhead-Garrett Co.
Eastern Handicraft Supply Co.
LeisureCrafts

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Blake Company, F. I.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Craftsman Wood Service Co.
Eastern Handicraft Supply Co.
Greenlee Tool Co.
Lufkin Rule Co.
Millers Falls Co.
North Bros. Mfg. Co.
Schweizer Aircraft Corp.
Stanley Tools

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Morgan Vise Co.
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Brodhead-Garrett Co.
Duro Metal Products Co.
Eastern Handicraft Supply Co.
Handcrafters, The
Hubbell Metals, Inc.
LeisureCrafts
Lufkin Rule Co.
Metal Crafts Supply Co.
Metal Goods Corp.
Schweizer Aircraft Corp.
X-acto Crescent Products Co., Inc.

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Brodhead-Garrett Co.
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Kalamazoo Tank & Silo Co.
Racine Tool & Mach. Co.
Stanley Electric Tool Div.

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Millers Falls Co.
O'Neil Irwin Mfg. Co.
Skil Corporation
Stanley Electric Tools

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Brodhead-Garrett Co.
Haag Machine Co., Inc.

METAL STAMPING MACHINES
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LeisureCrafts
Metal Goods Corp.
Schweizer Aircraft Corp.

METALS, SHEET
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Handcrafters, The
Hubbell Metals, Inc.
Metal Crafts Supply Co.
Metal Goods Corp.
Schweizer Aircraft Corp.

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Starrett Co., L. S.
Weston Electric Instrument Co.

MICROFARAD METERS
Weston Electric Instrument Co.

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Cincinnati Milling Mach. Co.
Lima Electric Motor Co.
Pootatuck Corp.
South Bend Lathe Works
Sheldon Machine Co., Inc.
U. S. Machine Tool
Williams & Co., J. H.

MILLING MACHINES
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Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Lathe & Tool Co.
Cincinnati Milling Machine Co.
Pootatuck Corp.
Rouse & Co., H. B.
Sheldon Machine Co., Inc.
U. S. Machine Tool

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Pootatuck Corp.
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Eastern Handicraft Supply Co.
Elliott Co., B. K.

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Walker-Turner Co., Inc.
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Dillabaugh Co., C. R.

MOTOR GENERATOR SETS
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General Electric Co.

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Brodhead-Garrett Co.
Delta Mfg. Co.
Dumore Co., The
General Electric Co.
Heston & Anderson
Lima Electric Motor Co.
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N

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Brodhead-Garrett Co.
Starrett Co., L. S.

NOTCHERS
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O

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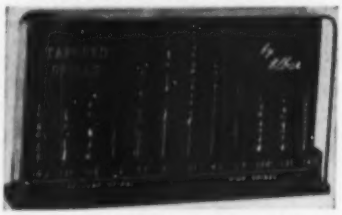

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(Continued from page 102A)

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(For Convenience Circle Index Code 0319)

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(Continued on page 106A)

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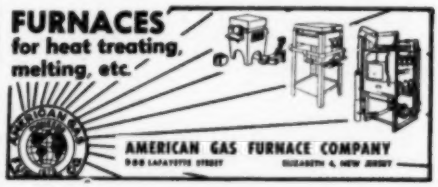

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Elliott Co., B. K.
Hunt Pen Co., C. Howard
Keuffel & Esser
LeisureCrafts
Post Company, Frederick
U. S. Blue Print Paper Co.
Weber Co., F.

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Hunt Pen Co., C. Howard
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Mall Tool Co.
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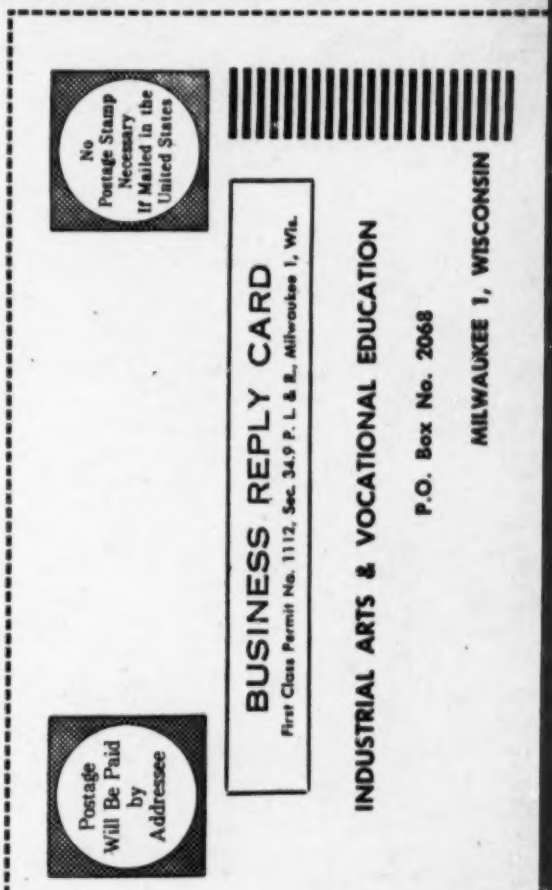
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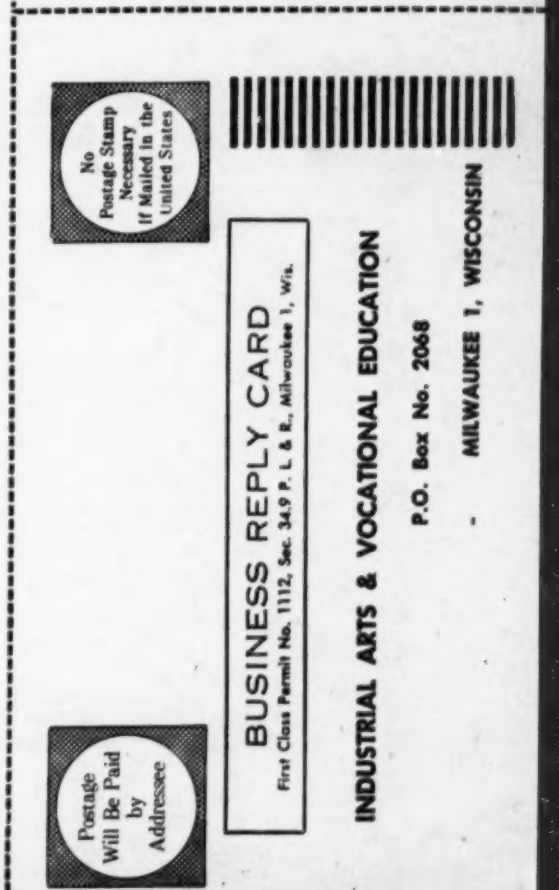
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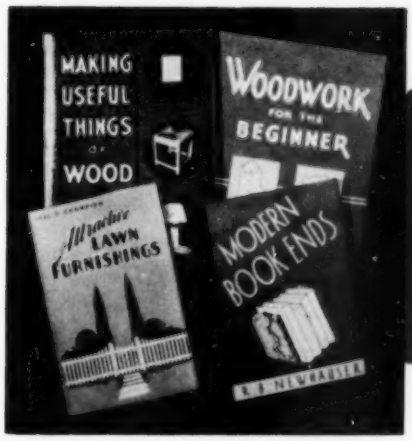

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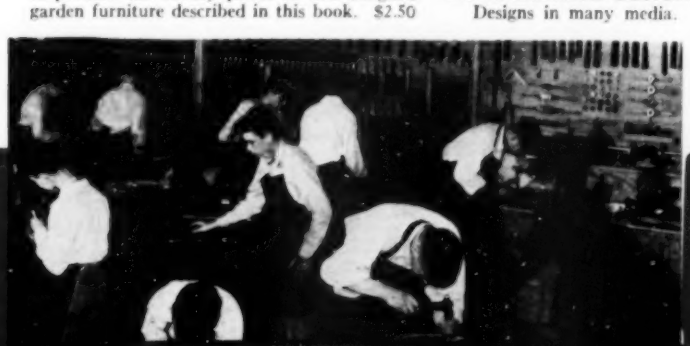

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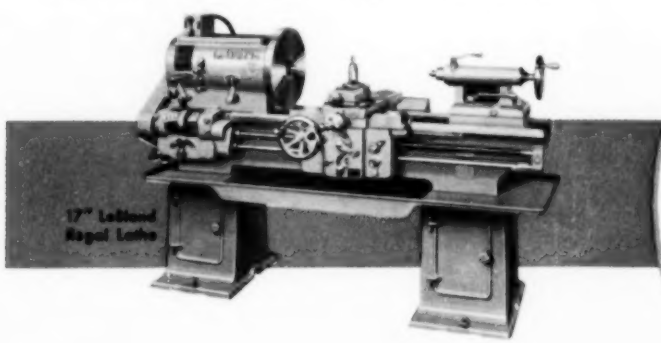

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